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Contents:

	PAGE
The Autumn Factory Lighting Campaign	341
The British Association	342
High-Pressure Salesmanship	342
The Marconi Royalty Decision	342
Regulations for Overhead Lines.—II, by A. Ekström and V. Ekström (*illus.*)	343
The Automatic Control of Static Condensers, by J. W. Fawcett	347
Aerial Views of Power Stations (*illus.*)	348
Steam to Electric Locomotive Conversion, by Capt. M. I. Williams-Ellis (*illus.*)	350
A Cabinet Mystery, by L. Rutledge	351
The Calibration of Power Meters, by A. Barham (*illus.*)	352
Legal	354
Business and Industrial Notes	354
Lighting and Power Notes	358
Tramway and Railway Notes	359
Telegraph and Telephone Notes	360
Radio Notes	360
Contract Information	361
Notes	362
Our Personal Column	365
Financial Section—	
New Companies Registered	365
Official Returns of Electrical Companies	366
Financial Section - *contd.*	
City Notes	367
Stocks and Shares	367
Conditions in Jugo-Slavia	369
The Corean Machinery Market	369
Electrical Imports of British Malaya	370
Electrical Imports in New Zealand	370
Synchronous Motor Driving (*illus.*)	371
Metal-Enclosed Switchgear (*illus.*)	372
New Electrical Devices, Fittings, and Plant (*illus.*)	373
Reviews	374
Selected Radio-Telephone Apparatus (*illus.*)	376
Correspondence—	
Pure Food	377
Engineering Mathematics	377
An Engineer's Reading	377
Shoddy Wiring	377
Past and Present Conditions of Jointing	377
Electric Heat in the Garden	378
Overhead Lines	378
Does It Pay to Acquire Knowledge?	378
Radio Valve-Anode Capacitive Resistance	378
Lamp Discounts	379
Published Specifications	379
Trade Mark Applications	379
New Work for Contractors	380

The Autumn Factory Lighting Campaign.

WITH the passing of the month of August the electrical and various other branches of trade which reach their highest point of activity during the winter half-year—if we may gloomily so describe it—seem more or less rapidly to make their way into the uncongenial conditions of gloom and darkness, fog, damp and cold. Plenty of illumination and plenty of warmth are what everybody needs to chase away these adverse surroundings and to ensure comfort, health and happiness. We shall be putting away the fans and thinking about the furs, and electrical men and women alike will be applying their already thought-out plans for making the most of the opportunity for giving electricity a chance of proving its value in modern life.

Leaving the general and turning to the particular, we have no hesitation whatever in giving the cordial good wishes of the whole electrical industry to the Factory and Workshop Lighting Campaign, planned by the Lighting Service Bureau and conducted by the British Electrical Development Association. Later we may be privileged to note the gratitude of many, both employers and workers alike in general industry, for the blessings that it will bring them. The Campaign opens in the month which begins to-morrow; it lasts through October and November; and from an examination of

its programme, to which we make further reference on another page, we regard it as promising to have a useful influence in impressing upon manufacturers and those responsible for operations in their works, the benefits of good illumination.

One feature of the scheme is, of course, direct mail publicity on different dates from September 10th to October 29th.

As five successive letters and educational leaflets will be sent to over 100,000 factories and workshops, the field of operations is extensive. Previous campaigns on better lighting have been attended with good results, and there is every reason to believe that the present effort will be even more successful. The way has been paved for this campaign by the steady influence in favour of better lighting which has been exercised by the Factory Department of the Home Office for quite a number of years. Consultations with joint industrial councils have already imbued both masters and men in certain trades with a recognition of the advantages of good illumination, and in the meantime individual makers of lamps and lighting accessories have not been idle; some of the educational work conducted by such firms has been excellent of its kind.

Another circumstance which should aid this campaign is the direct appeal which it conveys to self-interest, on the part of both management and workers. The latter will quickly recognise that bad lighting imposes a handicap and renders it difficult for them to put forth their best efforts; that it increases industrial fatigue, and in some cases adds to the hazards of their employment. Employers likewise have everything to gain by better lighting, the cost of which almost invariably forms but a small fraction of the cost of production.

The case for good lighting in factories should, therefore, be a relatively easy one to demonstrate—certainly easier than the case for public lighting, the benefits of which are more widespread and are less readily grasped by individuals. Employers generally are sympathetic. Defects in lighting are due, in the main, to lack of knowledge.

It is, of course, difficult in any scheme of propaganda to summarise the requirements of good industrial lighting in full. The necessity for adequate working illumination is usually emphasised, and schedules of illumination values are frequently quoted. Yet such points as the choice of lighting fittings, the positions assigned to them, and the conditions in regard to shadow and glare, are at least equally important. Similarly, whilst leading firms in the lighting industry naturally aim at the standardisation of methods and equipment so far as possible, the enlightened manufacturer should recognise that each industrial process presents special problems, and that factory lighting can never be a rule-of-thumb process.

The first aim in propaganda, therefore, must be to kindle interest. This, as we have indicated, has been partly done already. The Campaign effort will increase it and the full process of education and application will surely follow—speedily, we trust—in everybody's interest.

The British Association.

On Wednesday next the annual meeting of the British Association for the Advancement of Science commences at Glasgow with the reading of his presidential address by Sir William H. Bragg, K.B.E. Although, as its title indicates, the Association's first aim is the promotion of interest in science and the stimulation of scientific investigation, it has never been unmindful of the fruits of science reaped by civilisation through industry and commerce. This is proved by the fact that the president's address usually surveys fields in which the application of scientific principles or discoveries has been of material service to humanity. Sir William Bragg's address bears the title: "Craftsmanship and Science," and in it he shows how the combination of skill and intellect contributes to human progress.

A number of papers of electrical interest will be presented during the meeting in both the Physical and Engineering Sections. Professor A. W. Porter's presidential address to the Mathematical and Physical Sciences Section (A) is entitled: "The Volta Effect: Old and New Evidence," while in his address before Section G—Engineering, Sir William Ellis, the sectional president, will deal with the electrical industry in the course of a survey of the benefits which engineering has conferred upon humanity.

High-Pressure Salesmanship.

In a recent issue we raised a protest against the methods of salesmen employed by certain vacuum-cleaner manufacturers who pester householders to such an extent that they are browbeaten into allowing a demonstration of these cleaners in their houses. The spiritual home of this class of salesmanship is the United States, where all kinds of extraordinary schemes are employed to force people to buy things which they really do not want. One of these schemes, as we have mentioned before, is to ring up a housewife on the telephone, and without acquainting her of the identity of the caller suddenly say: "Are you going to buy a vacuum cleaner this week?" This, it is claimed, "unbalances" the woman, who is likely to answer in such a way as to open the door to further attacks.

Every issue of the American trade organs details some such "stunt," and the reader might be pardoned for thinking that the American public actually *like* this sort of thing. There are, however, signs that, like ourselves, it is becoming restive and disinclined to endure much longer these crude business methods. In the current issue of *Electrical Merchandising*, side by side with accounts of more high-pressure selling "stunts," there appears an article which studies the reasons for the public's backwardness in buying electrical appliances. One reason given is "the present knock-down-and-drag-out method of appliance solicitation." People who really want to buy appliances are unable to make a calm decision, but are so pursued and badgered by "high-pressure salesmen" that in desperation they abandon the idea. Then the h.p. salesmen are left to operate upon people who do not intend to buy electrical appliances if they can help it.

We may be thankful that these methods have failed to obtain a foothold here, and this may prove a timely warning to those who think that the British public will "stand for it," to use a phrase which they will understand.

The Marconi Royalty Decision.

The decision of the Comptroller-General of Patents and his Assistant ordering the Marconi Company to grant licences for the manufacture of receiving sets under considerably reduced royalties is a momentous one.

It has been generally felt that the existing royalty is too great; with the cheapening of production it represents a very considerable proportion of the total cost, especially in the low-priced sets.

Although the decision applies so far only to the applicants in the case, there is no doubt that the principle will have to be extended to all licensees under the patents involved, and the result should be a considerable impetus to the sale of receiving apparatus. It seems safe to say that the crystal set will be superseded even in many poorer homes.

The matter cannot be regarded as settled yet, for the Marconi Company will probably appeal against the decision.

Regulations for Overhead Lines.-II.

A Comparison between the Swedish and British Regulations.

By ALFRED EKSTRÖM, D.Sc., M.I.E.E., and VIDAR EKSTRÖM, Civil Engineer.

THE subject of maximum spans, compared according to the English and Swedish Regulations, having been dealt with in a previous article*, our purpose now is to determine the effect of the Regulations on the total cost of overhead lines.

I—Leakage of Current.

The English Regulations prescribe that *the supporting metalwork of all insulators shall be permanently connected with earth.* This provision exposes a workman, when climbing a pole, to a considerable risk; further, at the higher voltages it means that a bird resting on the support, when flying up, may easily come into contact with a line conductor and thus cause a short circuit with its probable consequences of arcing and interruption of service. Experience has also shown that in the interest of continuous service this arrangement is not to be recommended.

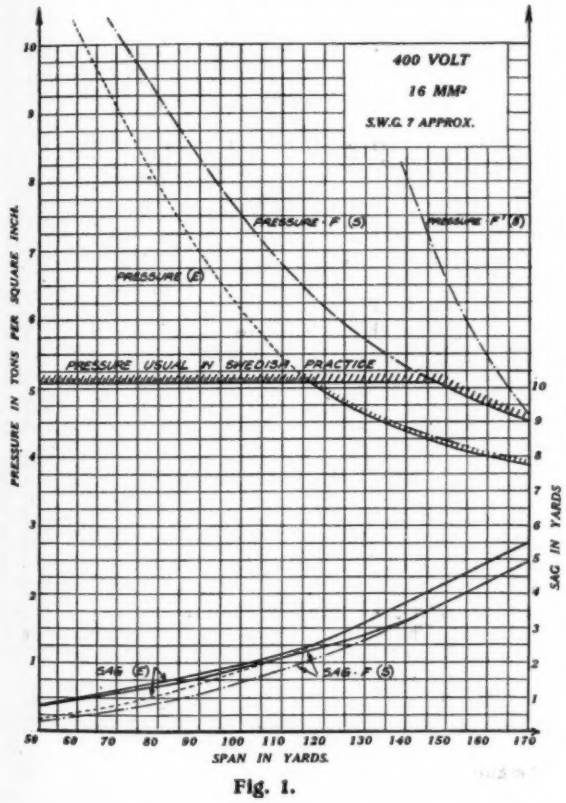


Fig. 1.

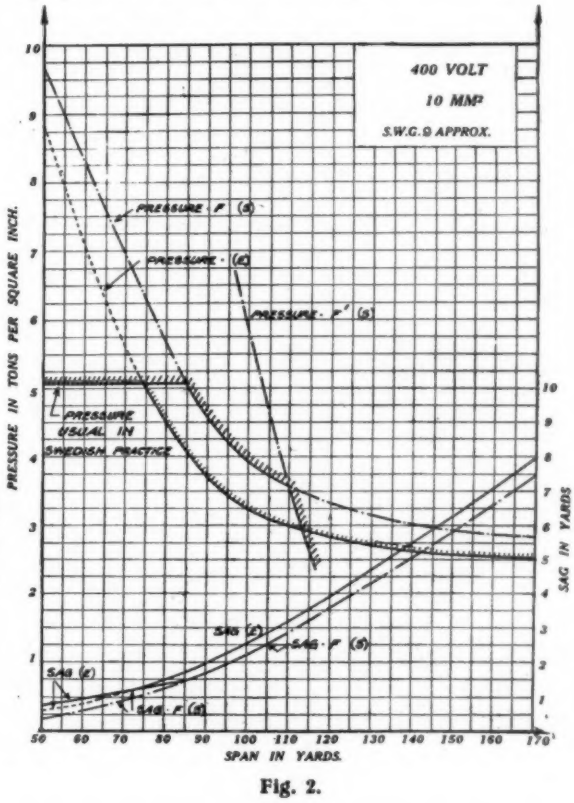


Fig. 2.

The comments of Mr. C. L. Weber on the German Regulations, 15th Edition, are of interest in this connection: "The earthing (of the supports of the insulators) is nowadays given up, as it is generally considered most valuable to utilise the insulation to earth offered by the wooden poles themselves."

The English Regulations prescribe, moreover, for *the provision of a neutral, or earthed, conductor carried continuously from pole to pole and so arranged with relation to the other conductors that, in the event of the breakage of any one of them, the line conductor shall make contact with the earthed wire.*

If this prescription is to be of real value, it ought to be completed (as in the lately proposed German regulations) by a stipulation that this conductor must be of such dimensions that, in the event of a single-phase short circuit, a current large enough to secure the release of the faulty line shall flow. This will, however, generally lead to over-dimensioning of the earthed or neutral conductor, which will raise the cost of the overhead lines. Such a short circuit might, moreover, cause either one or both of the conductors to be burnt, or the insulators damaged, before the protective devices had time to break the circuit. Further inconvenience may be caused by the heavy drop of voltage occasioned by such a short circuit, as it is likely to be detrimental to the lighting and power supply as well as to the parallel operation of generators. Such an earthed conductor has not been found satisfactory in service, as reliable contact between the line conductor and the earthed conductor in case of breakage is seldom secured.

For high-voltage lines it has, therefore, been found more suitable to introduce a combined overload and leakage-current protective relay system without the use of a special earthed conductor, with the result that the above-mentioned troubles are eliminated.

II—Load and Dimensions of Poles.

Comparison between the Swedish and English Regulations concerning Sags and Tensions at Different Spans.—The maximum spans allowed by the prescribed Regulations having been considered, the height of the poles has to be decided. The factors which affect their height and are dependent on the length of the spans, are the sags and the distance of the conductors from one another. In practice, spans of between 55 and 165

* Article I was published on August 3rd, 1928; pp. 185-8.

yards (50 to 150 metres) are employed for rural overhead lines. Figs. 1 to 4 show the greatest tensions permissible by the English and Swedish Regulations for different spans, and their corresponding sags at the temperature of 122 deg. F. (50 deg. C.).

Tension.

England.—The diagrams (shaded curves, pressure E) show that according to the English Regulations spans of up to 165 yards (150 metres) are permissible; but, if the tension of the conductors does not exceed that prescribed, considerably less tension must be used in England than in Sweden for spans exceeding 50 or 60 yards (55 to 66 metres) at the higher voltages (see figs. 3 and 4).

As has been already mentioned, the pulling up of the conductors to a relatively great tension occasions increased security of the power supply, as it reduces the risk of entanglement of the conductors, though great tension under quite exceptionally severe climatic conditions may cause the material to be strained over the limit of elasticity. On the other hand, a low tension reduces the risk of overstrain of the material, but increases the risk of entanglement of the conductors, and necessitates the use of high and expensive poles. Experience has proved that a tension of 5.08 tons per sq. inch (8 kg. per mm²) is suitable for overhead lines of this kind. Such low tensions as 2.54 and 3.18 tons per sq. inch (4 and 5 kg. per mm²) corresponding to spans of 87.5 and 76.5 yards (80 and 70 metres) in figs. 3 and 4, are seldom used.

Sweden.—As already stated, the Exceptional Ice-load Regulation (Article I) is seldom recognised in practice for spans of overhead lines of this kind (compare curve, "Pressure F¹ (S)"). In fact, the Normal Ice-lead Regulation is always the recognised one for overhead lines of 400 V, 16 mm², No. 7 s.w.g. and 3.3 kV, 16 mm², No. 7 s.w.g. (compare curve, "pressure F. (S)"). According to fig. 3 tensions of at least about 3.8 tons per sq. inch (6 kg. per mm²) are permissible for all practically used spans. Compare the full-line part of the curve "Pressure usual in Swedish Practice," "Pressure F (S)" (the shaded curve shows the tension corresponding to each span).

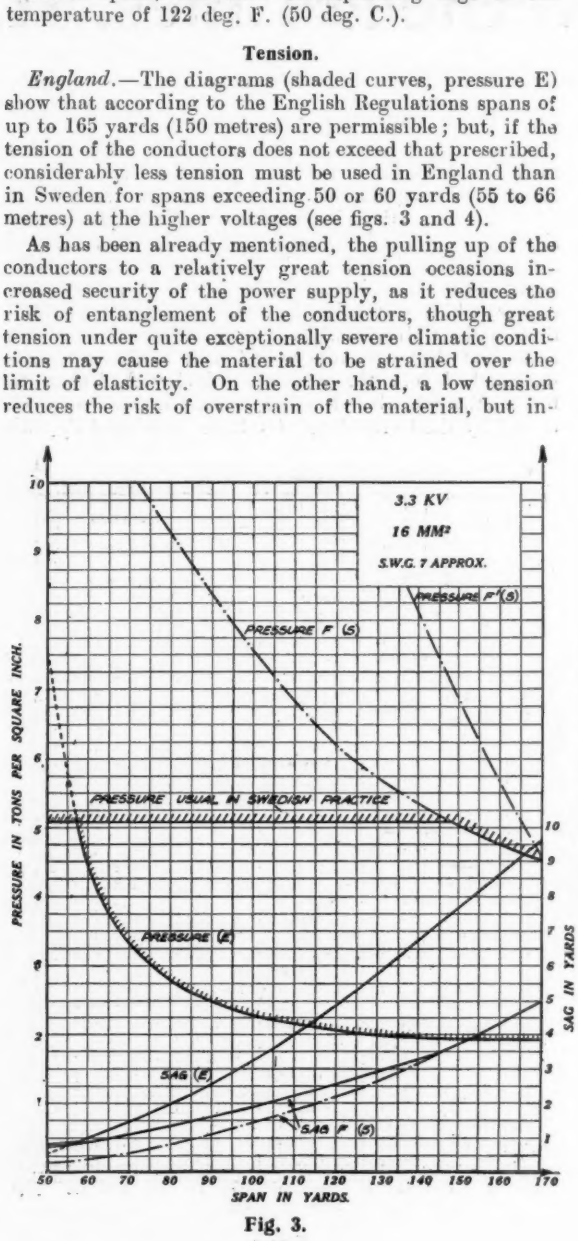


Fig. 3.

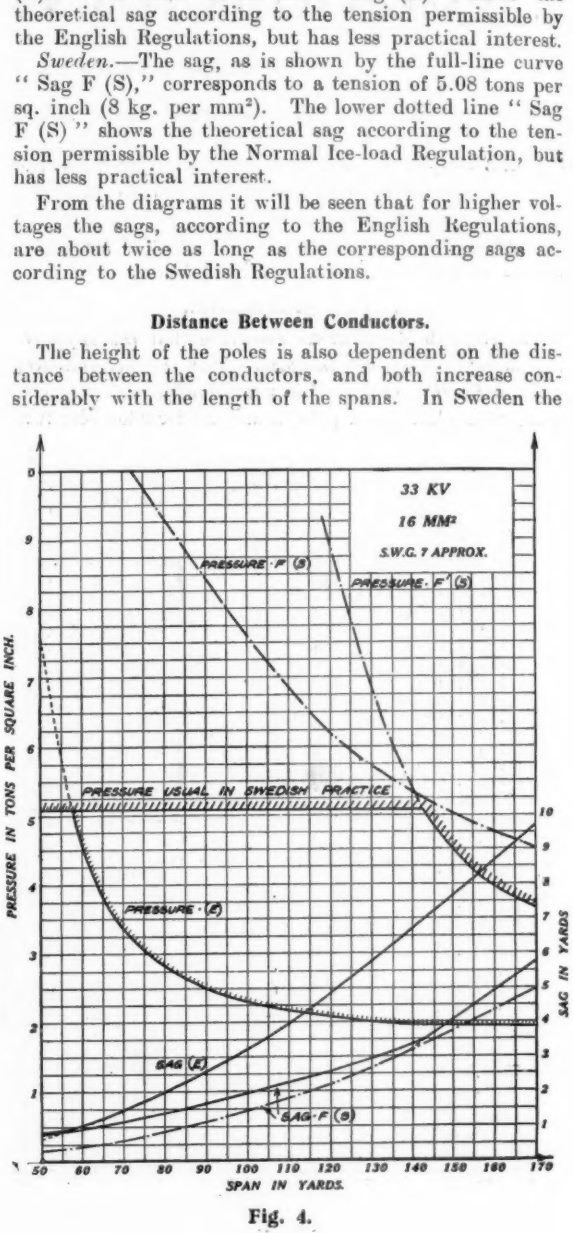


Fig. 4.

Sag.

England.—The sag will increase quickly with increasing length of spans, as is shown by the curve "Sag (E)." The lower dotted line "Sag (E)" shows the theoretical sag according to the tension permissible by the English Regulations, but has less practical interest.

Sweden.—The sag, as is shown by the full-line curve "Sag F (S)," corresponds to a tension of 5.08 tons per sq. inch (8 kg. per mm²). The lower dotted line "Sag F (S)" shows the theoretical sag according to the tension permissible by the Normal Ice-load Regulation, but has less practical interest.

From the diagrams it will be seen that for higher voltages the sags, according to the English Regulations, are about twice as long as the corresponding sags according to the Swedish Regulations.

Distance Between Conductors.

The height of the poles is also dependent on the distance between the conductors, and both increase considerably with the length of the spans. In Sweden the distance in metres between the supports of the conductors is determined by means of the following formula:—

$$0.65 \times v/100 \times \sqrt{b} + 0.01 \times E$$

where v is full windpressure in kg. per mm.², b is the sag in metres at a temperature of +50 deg. C. and E is the voltage in kV. In fig. 5 the oblique phase distance is marked F_H and the line F_K is obviously decisive for the length of the pole; its magnitude can easily be determined as the distance F_C is known (=the diameter of the pole + 2 × the distance from the insulator to the pole): $F_K = \sqrt{F_H^2 - F_C^2}$.

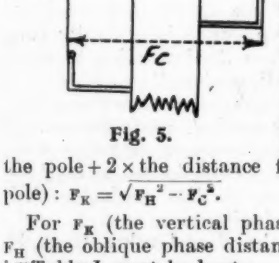


Fig. 5.

For F_K (the vertical phase distance) as well as for F_H (the oblique phase distance) the minimum indicated in Table I must be kept:—

Table I.

	F_K	F_H	F_K	F_H
400 V	450 mm.	500 mm.	17.7 in.	19.7 in.
3.3 kV	600 mm.	800 mm.	23.6 in.	31.5 in.
33 kV	1,000 mm.	1,400 mm.	39.5 in.	55.0 in.

The distance between the highest and the lowest insulator is decisive for the length of the pole. In Sweden, where an earthed conductor is not generally used at 3.3 kV or at 33 kV, this distance will be $2 \times F_K$. In England, where such an earthed conductor is prescribed, the distance will be $3 \times F_K$. For low-voltage overhead lines, whereon the neutral conductor is generally necessary, the distance will be $3 \times F_K$ in both countries. (The English Regulations seem to permit of the neutral conductor being used as a bonding wire for earthing.)

Height of Poles.

Figs. 6 to 8 show the resulting height of the poles, which is determined by :—

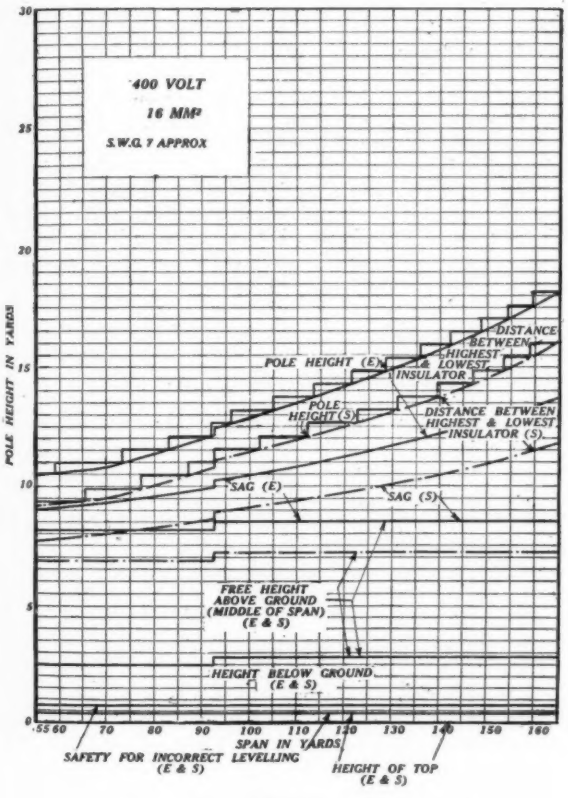

400 VOLT
16 MM²
S.W.G. 7 APPROX
POLE HEIGHT IN YARDS
POLE HEIGHT (E)
DISTANCE BETWEEN HIGHEST & LOWEST INSULATOR
POLE HEIGHT (S)
DISTANCE BETWEEN HIGHEST & LOWEST INSULATOR (S)
SAG (E)
SAG (S)
FREE HEIGHT ABOVE GROUND (MIDDLE OF SPAN) (E & S)
HEIGHT BELOW GROUND (E & S)
SPAN IN YARDS
SAFETY FOR INCORRECT LEVELLING (E & S)
HEIGHT OF TOP (E & S)

Fig. 6.

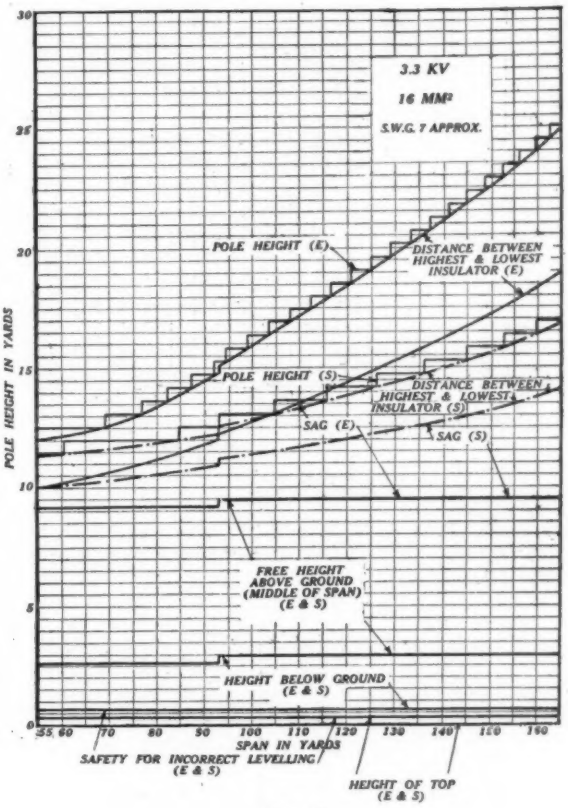

3.3 KV
16 MM²
S.W.G. 7 APPROX.
POLE HEIGHT IN YARDS
POLE HEIGHT (E)
DISTANCE BETWEEN HIGHEST & LOWEST INSULATOR (E)
POLE HEIGHT (S)
DISTANCE BETWEEN HIGHEST & LOWEST INSULATOR (S)
SAG (E)
SAG (S)
FREE HEIGHT ABOVE GROUND (MIDDLE OF SPAN) (E & S)
HEIGHT BELOW GROUND (E & S)
SPAN IN YARDS
SAFETY FOR INCORRECT LEVELLING (E & S)
HEIGHT OF TOP (E & S)

Fig. 7.

(*a*) Depth below the surface of the soil, varying with the height of the poles from 5 to 10 feet (1.6 – 3 m.).

(*b*) Allowance for incorrect levelling, calculated at 1 foot (0.3 m.).

(*c*) Free height above the soil, calculated according to Table II below :—

Table II.

	England.		*Sweden.*
400 V	17 ft. (5.18 m.)	...	13 ft. (4 m.)
3.3 kV	20 ft. (6.18 m.)	...	16½ ft. (5 m.)
33 kV	20 ft. (6.18 m.)	...	17¾ ft. (6 m.)

(*d*) Sag, according to figs. 1 to 4.

(*e*) Distance between highest and lowest insulator.

(*f*) Height of the free top, calculated at 1 foot (0.3 m.).

The total height of the pole is shown by the upper curves in figs. 6 to 8, and the normal height of the poles, which may vary some 1½ feet (½ m.), is shown for different spans by the stepped curve. It will be seen that, while according to the English and Swedish Regulations the lengths of the poles for low-voltage differ only about one yard, the lengths for higher voltages must be 4 to 6 yards greater.

Diameter of the Poles.

On calculating the diameter of poles for overhead lines for similar cases according to the English and Swedish Regulations, one is surprised by the considerable difference between the prescribed safety factors of wooden poles. In England a safety factor of 3.5 is prescribed, while the corresponding figure in Sweden is 2.6, the limit of the load being about 350 tons per sq. inch ([illegible] kg./mm²). Closer investigation shows, however, that the English Regulations consider the forces exerted on the poles to be considerably lower than the Swedish Regulations do, so that the actual difference between the pole diameters is not considerable. The former ones prescribe a less radial thickness of the ice-coated conductor, but assume the weight of ice to be 57 lb. per cu. ft. (0.91 kg. per dm³), while the latter prescribe from 2 to 3 times larger radial thickness of the ice-coated conductor, but assume the weight of ice to be only 30.8 lb. per cu. ft. (0.5 kg. per dm³).

The consequence of this is that : (1) the resulting horizontal forces, which are proportional to the exposed area in England, are considerably lower in England than in Sweden, and (2) the vertical forces, which are proportional to the weight, are approximately the same in England as in Sweden. The horizontal forces are, however, decisive for the calculation of the pole-diameter, so that the Regulations of both countries give approximately the same values for the pole diameters. In this connection it might be of interest to mention, as has been dealt with in a previous article regarding maximum permissible spans, that the maximum permissible tension of copper is also considerably lower in England than in Sweden.

One might, perhaps, be apt to think that also this difference in the regulations of both countries is counteracted by the different ice-load prescriptions. This is, in fact, the case regarding overhead lines of low voltage (400 volts) whereon the radial thickness of ice is assumed to be only about one-third of that in Sweden ; but for the higher voltages, when the radial thickness is more than half of that in Sweden, the assumed greater weight of the ice according to English Regulations will counter-

act the prescribed lower radial thickness of the ice-coated conductor, with the result that the resulting load on the conductor will be approximately the same according to the Regulations of both countries. Thus, for the higher voltages the difference in the permissible tension

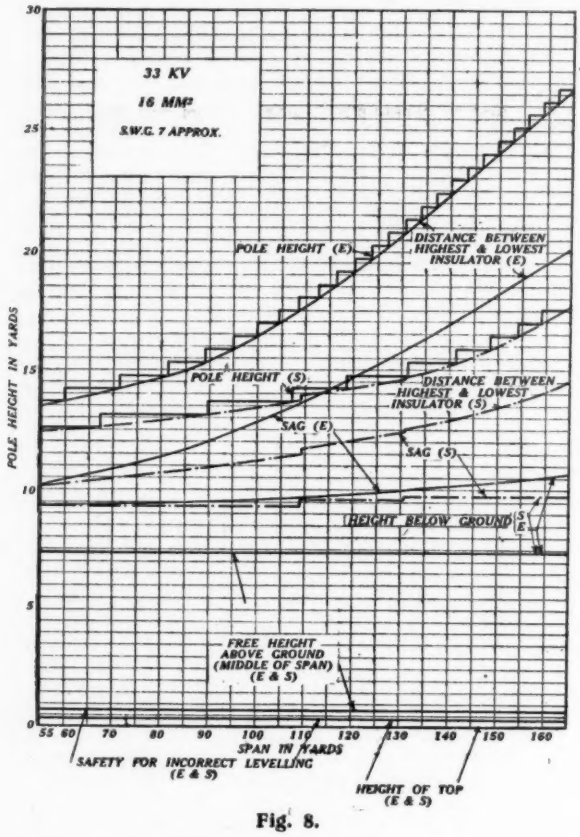

33 KV
16 MM²
S.W.G. 7 APPROX.
POLE HEIGHT (E)
DISTANCE BETWEEN HIGHEST & LOWEST INSULATOR (E)
POLE HEIGHT (S)
DISTANCE BETWEEN HIGHEST & LOWEST INSULATOR (S)
SAG (E)
SAG (S)
HEIGHT BELOW GROUND (S & E)
FREE HEIGHT ABOVE GROUND (MIDDLE OF SPAN) (E & S)
POLE HEIGHT IN YARDS
SPAN IN YARDS
SAFETY FOR INCORRECT LEVELLING (E & S)
HEIGHT OF TOP (E & S)

Fig. 8.

of copper will be decisive, and leads, as mentioned, to much shorter spans in England than in Sweden (see Table III).

Table III.

Voltage.	Area in mm².	Radial thickness of ice in mm.		Outside diam. of iceloaded conductor, in mm.		Vertical forces in kgmm.		Wind-pressure against conductor in kg. mm.	
		Sweden.	England.	Sweden.	England.	Sweden.	England.	Sweden.	England.
400 V	10	15	4.75	34	13.5	0.54	0.20	0.85	0.51
400 V	16	15	4.75	35	14.0	0 62	0.26	0 88	0.55
3 3 kV	16	15	9.5	35	23.5	0.63	0.52	0'88	0.92
33 kV	16	17	9.5	37	23.5	0.74	0.52	0'98	0.92

Summary and Conclusions.

The English Regulations involve the necessity of using poles considerably longer and thicker than those required by the Swedish Regulations for corresponding spans at higher voltages, for the following reasons:—

(i) The small mechanical strength of copper at a tension of about 13.5 tons per sq. inch assumed by the English Regulations compared with 20.3 tons per sq. inch assumed by the Swedish ones; as well as the high value of the modulus of elasticity of 18×10^6 lb. per sq. in. in England, as compared with 14.2×10^6 to 11.2×10^6 lb. per sq. in. in Sweden.

(ii) The necessity of an earthed conductor from pole to pole, as prescribed by the English Regulations.

(iii) The greater clearance of the conductors above the ground in England than in Sweden.

For the overhead lines considered the use of wooden poles is common, steel constructions being used only for lines of the highest classes (I—III; even in these classes wooden poles are often used). It is of considerable advantage to impregnate the poles with creosote.

III—Total Costs of Overhead Lines.

Having considered the dimensions of the poles for overhead lines of different kinds, with different spans, it is now necessary to determine the cost involved in the erection of complete overhead lines.

Fig. 9 shows the costs for different spans of overhead lines. The cost of the poles is calculated according to estimates for delivery free on the quay in any English North Sea harbour. Wayleaves are calculated at from 16.5 to 22 shillings (15 to 20 kr.) per pole and staypole. Other costs are assumed to be similar in England and Sweden.

It will be seen that there is a considerable difference between the costs of high-voltage lines of 33 kV and those at the intermediate voltage of 3.3 kV. Though this system necessitates about 10 per cent. increased number of transformer stations on account of the double transformation, the costs of the 3,300/400-volt transformer stations are so considerably lower than those for 33,000/400 volts that this reduction in cost will cover not only the cost of the increased number of transformer stations, but also more or less that of the increased transformer losses.

It is therefore obvious that an intermediate voltage system, as introduced in Sweden by the Hemsjoe Power Co., to supply power in local districts within a radius of from three to four English miles, means a considerable saving in capital. From the technical supply point of view this system possesses the great advantage, in the case of an extensive rural electrification scheme with a large number of villages, that disturbance in the low-

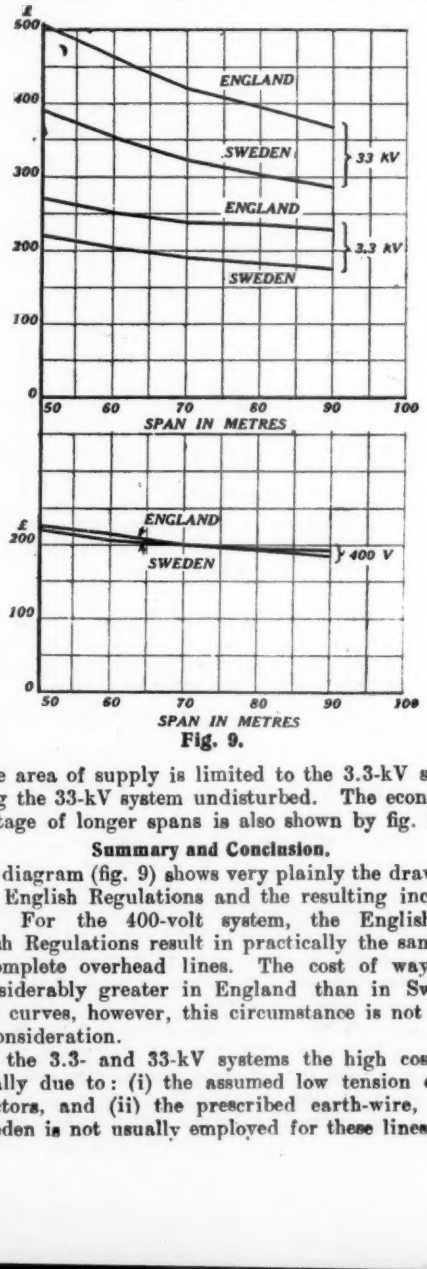


Fig. 9.

voltage area of supply is limited to the 3.3-kV system, leaving the 33-kV system undisturbed. The economical advantage of longer spans is also shown by fig. 8.

Summary and Conclusion.

The diagram (fig. 9) shows very plainly the drawbacks of the English Regulations and the resulting increased costs. For the 400-volt system, the English and Swedish Regulations result in practically the same cost for complete overhead lines. The cost of wayleaves is considerably greater in England than in Sweden; in the curves, however, this circumstance is not taken into consideration.

For the 3.3- and 33-kV systems the high costs are especially due to: (i) the assumed low tension copper conductors, and (ii) the prescribed earth-wire, which in Sweden is not usually employed for these lines.

Supplement.

Since the first part of this article was printed, the Electricity Commission has published its "Report of Proceedings of Conference on Electricity Supply in Rural Areas." The estimated costs of overhead lines in Appendix I, page 63, being at first glance much higher than those given in the article above, we will give a short analysis of them.

The costs for overhead lines quoted in the above report cover 11-kV and 3.3-kV, three-phase lines as well as 400-V, 4-wire lines. The conductors are respectively of 0.05, 0.0225, and 0.05 sq. inch. The spans are about 100, 55, and 50 yards. If we adjust these figures to conductors of 0.025 sq. inch for 11-kV and 3.3-kV and to 0.0156 sq. inch for 400 V it is more convenient to compare the costs given in the report with those calculated above. For a fair comparison it might also be correct to reduce the costs given in the report for poles and equipment on account of the correspondingly reduced weight of the conductors by 25 per cent., and for labour and supervision by 10 per cent. for the 11-kV lines and by 10 and 5 per cent. for the 400-V lines.

With these adjustments, the following table shows the costs in the report compared with those considered feasible by the authors under the British Regulations.

The costs for 11- and 33-kV lines have been put together, as the standard of the 11-kV line is very high, both being of the same character and importance.

ESTIMATE OF COSTS OF OVERHEAD LINES FOR

	11 and 33 kV. Spans about 100 yd. Report.	Authors.	3 kV. Spans about 60 yd. Report.	Authors.	400 V. Spans about 55yd. Report.	Authors.
Construction:	£	£	£	£	£	£
Poles, etc., and Conductors ...	255+67 =322	281	150+61 =211	195	108+51 =159	149
Labour and Supervision ...	196	59	120	47	114	45
Total ...	518	340	331	242	273	194
Wayleaves, etc. Survey and negotiations	15	28	10	31	10	31
Easements (capitalised) ...	60		85		40	
Compensation claims, etc. ...	15		10		6	
Total, per mile ...	608	368	436	273	329	225

Discussion of above Table.

1. The main difference is in the pole costs, which should be considerably reduced by buying larger quantities than is calculated in the estimates in the Report.

2. On the other hand, the Report calculates on much higher costs for labour and supervision than are considered necessary in Sweden. This might chiefly be explained by the remark of the Report itself that "a straight mile of line across open country could be erected at a substantially lower figure." In rural electrification of large areas this should *always* be the case for 33-V lines, and generally for the 3.3-kV lines.

3. A great difference in costs is found in the wayleaves. It is considered that annual rentals should very seldom be paid. The rural lines generally pass over land belonging to farmers who wish to be supplied with electrical energy from the undertaking. In Sweden and other parts of the Continent such annual rentals are immediately stopped as soon as a landowner becomes a customer of the company.

With these amendments to the Report it seems that the estimates put forward in the previous section of this article are easily attainable in England. The above-mentioned costs for overhead lines could, however, be considerably reduced by using longer spans instead of those now used in England under the present Regulations upon which the Report is based. A change of length of span is absolutely necessary for 3.3-kV lines.

Recommendation (ii) on page 13 in the Report cannot be too strongly emphasised. Therein is proposed a relaxation of the new Code of Overhead Line Regulations as regards factors of safety in respect of lines for supplying sparsely-populated rural areas, and a consideration of the practicability of providing different classes of construction for different types of rural area.

The Automatic Control of Static Condensers.

An account of a method of control depending on the load.

By J. W. FAWCETT.

IN the near future many engineers in charge of small and moderate-sized undertakings will doubtless be faced with the complex question of purchasing supplies on the two-part tariff method, and should the load of the undertaking be of such a nature as to produce a lagging power factor of less than 0.85, the problem of increasing the power factor of the load to nearer unity will demand consideration.

Where it is necessary to have attendants in charge of sub-stations it will be possible—and probably more economical—to install synchronous plant to obtain the desired result, but in this article I wish to deal with sub-stations which are left unattended for long periods. I am aware, of course, where large power consumers are coupled to the mains, that it is sometimes possible to make arrangements for the installation of synchronous motors in their driving equipment.

Probably the best known and most widely adopted method of operating static condensers is by a time switch set to operate the controlling contactor gear at predetermined times. In my opinion, however, this has certain disadvantages, such as the stoppage of the clock, whether due to mechanical failure or forgetfulness on the part of the person whose duty it is to rewind it. As very few clocks keep accurate time, either losing or gaining slightly, there is always the risk of the load coming on before the condenser has been switched into circuit, or of the condenser being switched out before the load has dropped off. This especially applies when the setting of the time switch is very close to the time at which the load is due to come on or go off.

Some time ago, when considering the installation of a static condenser, I devised a method which obviates the use of a clock altogether, being a system of relays and contactors which switch in and out the condenser with the rise and fall of the current in the main bus-bars. It was first thought that a contact-making ammeter would be a suitable instrument for energising and de-energising the contactor circuit, but this proved to be far too sensitive for the purpose, so it was replaced by a solenoid type of relay, which is designed to close the contactor circuit at thirty primary amperes, and open it when the current falls to fifteen amperes, the normal steady load being approximately forty-five amperes at 11,000 V.

Reverting to the drawbacks attached to time-switch-operated equipment, and taking into consideration the fact that Reason demand indicators (which are extensively used for the measurement of kVA demand) record 83 per cent. of the current being taken in ten minutes and the remaining 17 per cent. in a further 20 minutes, it is imperative that the condenser be in circuit before the current reaches 80 per cent. of its normal value. Otherwise the full benefit of having the condenser equipment is not being obtained.

Another drawback, this time from the supply authority's point of view, is that of the condenser remaining in circuit when the load has fallen to zero or thereabouts. This will produce an error on the integrating watt-hour meter, and in some cases will actually cause the meter to rotate backwards, due to the high leading power factor thrown on to the incoming mains.

I think the benefits to be derived from the switching of condenser equipments on the above lines may eventually lead to its substitution for the time-switch and hand-operated methods. The equipment under my control was supplied by the British Insulated Cables, Ltd., with the English Electric Co., Ltd., as sub-contractors for the transformers and control panel, and although the usual adjustments had to be made, as with anything of an experimental nature, the plant is now giving satisfaction, with a resultant saving of about 160 kVA.

Aerial Views of Power Stations.

WHILST, as a rule, the exterior view of an electric power station from the normal level is not particularly edifying, and affords but little information with regard to the design of the plant, considerable interest attaches to views taken from aeroplanes, which enable the eye to appreciate the lay-out as a whole, the relative proportions, type, and arrangement of the buildings, provision for coal storage, and facilities for transport of fuel and ash. The accompanying aerial views of four important British power stations will therefore, we hope, be found instructive. It is interesting to note that each of these stations has already been included in one or other of the four areas in which the Central Electricity Board has

Aerofilms, Ltd.] [*Hendon.*

Barking Electricity Works of the County of London Electric Supply Co., Ltd. : Plant Installed or Sanctioned, 240,000 kW.

N. S. Roberts] [*Rochdale.*

Barton Electricity Works of the Manchester Corporation : Plant Installed or Sanctioned, 162,500 kW.

launched schemes. Extensions are contemplated under the schemes for the Barton and Dalmarnock stations; 1932-33, and a further 25,000 kW by 1935-36. The 40,000 kW for Barton is included in the figure given of

A. S. Rogers] *[Rochdale.*

Dalmarnock Electricity Works of the Glasgow Corporation: Plant Installed or Sanctioned, 137,500 kW.

[Hendon.

Brimsdown (New) Electricity Works of the North Metropolitan Power Station Company: Plant Installed or Sanctioned, 50,000 kW.

Barton is to have an addition of 40,000 kW of plant by 1930-31, and Dalmarnock another 25,000 kW by 162,500 kW. The aggregate capacity of these four works, as at present planned, will therefore be 590,000 kW.

Steam to Electric Locomotive Conversion.

An old steam locomotive used at slate workings in N. Wales has been converted to electric operation, effecting a considerable saving in the working costs.

By CAPT. M. I. WILLIAMS-ELLIS.

AN interesting scheme for the conversion of an old steam locomotive to electric working has recently been carried out at the slate mines of Messrs. J. W. Greaves & Sons, Ltd., at Blaenau Festiniog, and the following particulars of the reconstruction, which was planned by the author, who is the firm's consulting engineer, may be useful to other companies that may care to pension off their old steam locos. in a similar manner.

The locomotive, fig. 1, had been in operation for nearly 30 years. It was completely stripped of its boiler, cab, cylinders, tanks, wheels, axle boxes, and so on, some of which were thrown on the scrap heap. The wheels were re-turned, the bearings and journals trued up, the crank pins on the driving wheels removed, and new pins fitted for the coupling rods. The cab was cut down to allow room for the trolley arms and fittings, and its top strengthened to permit it to receive the trolley gear, comprising two short trolley arms. Cross girders were placed inside the frame to receive the motor and reduction gear, and a key-way was cut in the driving axle for the sprocket wheel, while slight alterations to the brake gear were also carried out. The floor of the cab was also lowered to allow for the necessary head room for the driver. Finally, a steel-plate hood was constructed to cover both the motor and reduction gear, and provided with the necessary inspection doors, and so on.

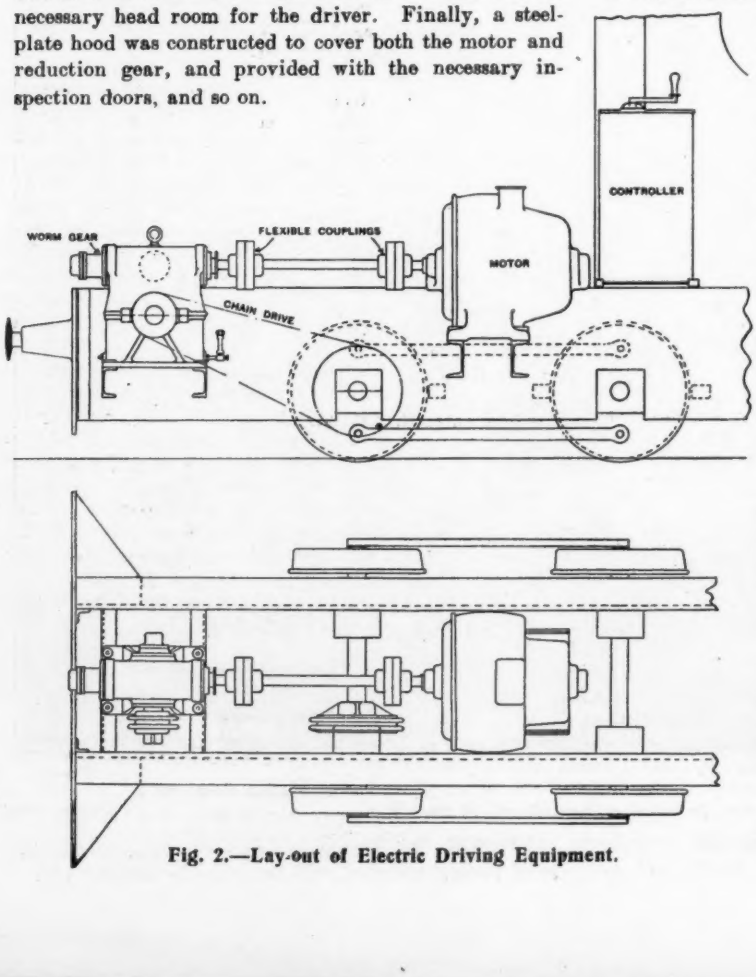


Fig. 2.—Lay-out of Electric Driving Equipment.

The motor is 15 b.h.p., 1,650 r.p.m., drip proof, 230-volt, d.c., and is connected through flexible coupl-

Fig. 1.—The Old Steam Locomotive.

ings to a worm-reduction gear having a chain drive of the double-link type to the driving axle.

Fig. 2 shows the general lay-out and design of the converted locomotive, and indicates the main feature of simplicity, besides that of neatness. The fittings inside the cab consist of a tramway-type controller, a full-rating grid-type c.i. resistance, d.p. circuit breaker with time-limit attachment, and a main lighting switch controlling the bulk-head lighting.

The reconstructed loco. has now been in operation some 18 months and given perfect satisfaction. It operates both on the level and against grades, the gradient in places being as much as 3.2 per cent. Its speed is from 3½ to 4 miles per hour. The overhead line follows standard practice, and has an O and not an 8 section. The electrical equipment at Messrs. Greaves's workings was described fully in the Electrical Review of August 20th, 1926, p. 287.

The total weight of the locomotive is four tons, and to get this weight special cast-iron blocks are attached to the front plate, which can be seen in fig. 3, a view of the electrified machine. The locomotive hauls slate blocks to the mills, rubbish to the tips, and so on. The cost for power per ton-mile of material hauled works out at 0.418d., and the consumption at 0.836 kWh. The actual saving effected over that of haulage by steam amounts to £136 per annum, while the whole cost of conversion was £295.

The whole of the conversion work was carried out by the mine staff, in the firm's own fitting shops, the motor

being supplied by the General Electric Co., Ltd., and the worm-reduction gear by Messrs. Wallwork, Ltd.

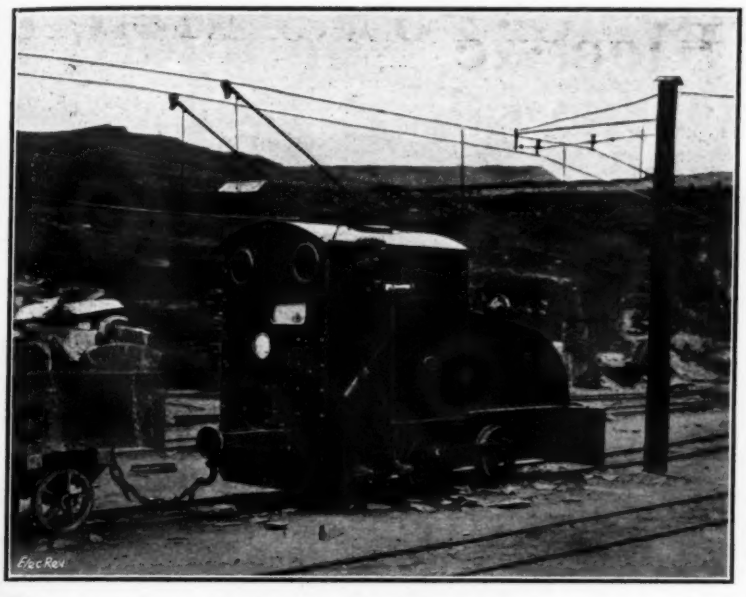


Fig 3.—The Converted Electric Locomotive.

It is of interest to learn that a second locomotive is now under construction at the mine in question on exactly similar lines.

A Cabinet Mystery.

Owing to the presence of tannic acid in oak, trouble may result from packing instruments in oak cases.

By L. RUTLEDGE.

THE title of this note does not mean that it deals with important Government secrets: far from it. It is just an instance that provides an *apologia pro vita sua* for the research engineer and his "unproductive" department which is the first to feel the draught when things financial are not too rosy.

The firm by which the writer was employed in that capacity some years ago, manufactured a type of electrical instrument eminently suitable for a business man's desk. Its inside was well made, though rather complex, and in the matter of its exterior, the æsthetic taste of the customer had to be considered. Whether his desk were of rosewood, walnut, oak, or mahogany, the instrument had to harmonise with its background—a very reasonable demand which the firm was always willing to meet.

It should be stated here that the metal frames inside the wood cabinets were built up of well sherardised iron, and that the best material was used throughout. Manufacture and assembly were both good, and inspection was thorough. Nothing was left to chance, so that when a strange trouble developed—which incidentally cost a lot of money—there was much speculation and investigation before the whole matter was turned over to the writer to provide the solution.

Now this was the nature of the trouble, though it looked more like a disease. A large consignment of instruments had been prepared and packed in oiled paper in strong cartons to await shipment to the East. Meanwhile they were stored in a large, airy warehouse, against the time when they should be soldered up in metal-lined cases. When the release came someone had a brain-wave and decided to open a carton to see that all was well. Not only the carton but the instrument was opened—and then things began to happen. The first instrument inspected showed a framework that looked like scrap-iron that had been out in the wet for many days and nights. For this a perfectly good soldering paste was unjustly blamed, also some perfectly good assemblers. The next carton yielded up a similar disaster, and so did others. It was obvious that the consignment could not be shipped, and the reason must be found.

The writer had every instrument unpacked and opened up, and though this troublesome job did not make for popularity, it provided the solution, or part of it, at any rate. The order had called for instruments in mahogany, walnut, and oak cabinets. The frames in the first two woods were found to be in perfect condition. In the oak-cased instruments every frame was badly corroded. The very obvious deduction that the oak was to blame was regarded as absurd. The firm that did the sherardising was blamed, and very properly denied any responsibility. As a matter of fact, under the microscope the sherardising process was shown to have provided an excellent protective coating of zinc, which also stood up to the standard chemical tests for metallic substances so treated.

Three cabinets, one of each wood, were impounded and cut up and three sandwiches were made, the "meat" consisting of a slip of highly polished iron. Two additional sandwiches were prepared, using absolutely green oak and well-seasoned oak. All were kept at normal room temperature for four days. Firm light pressure was maintained by means of screw clamps.

The following is a tabulation of the observations at the end of the period:—

Green oak: Weeping red drops.
Seasoned oak: Very slight red blush.
Cabinet oak: Marked red discoloration.
Mahogany: No change.
Walnut: No change.

Unfortunately, time did not permit of an analysis of the red growth that appeared on the specimens. It looked like rust, but it most certainly was not an oxide of iron. Oak contains more tannic acid than any other wood in common use. Tannic acid reacts violently with iron or iron compounds, but does not appear to have any particular reaction with zinc. It may be, therefore, that the "rust" was produced by electrolytic action, the tannic acid sweated out by the oak cabinets providing the electrolyte. Experiments with very dilute tannic acid on sherardised samples indicated that this was the case.

Small things can sometimes matter a great deal. If, therefore, the use of oak is a necessity, it is well to have a guarantee that it is well seasoned, and even after the guarantee to conduct a simple experiment on the lines indicated. It is better to be sure than to be sorry, and in the case of an oversea shipment to a trying climate, no precaution should be overlooked. I hope that no reader will say that no firm would think of using anything but teak for the Eastern market; if he does, I agree with him in advance, in principle, but the "non-productive" department is all too often a "voice crying in the wilderness."

French Buell Company Formed.

A company to exploit the Buell Combustion patents in France has been registered in Paris under the title "Compagnie Française Buell Combustion S.A." It has a capital of 12 million francs and has acquired the pulverised fuel patents and goodwill of the well-known French concern Anciens Etablissements Loy and Aube.

The Calibration of Power Meters.

The author, who is chief of the Meter Department of the Shropshire, Worcestershire and Staffordshire Electric Power Co., outlines a method of calibrating meters on site, with the aid of portable apparatus, which is claimed to eliminate all doubt.

By A. BARHAM.

MOST of the large electricity supply undertakings have recognised the need for well-equipped meter-testing laboratories as a safeguard against revenue leakage and disputed accuracy; but it generally happens that the more serious the dispute the more it becomes necessary to leave the meter untouched until each side has been satisfied.

Now, standards are kept in the test room: if one consents to allow a standard to be trailed round the countryside, it ceases to be a standard, and difficulties will arise, as both the accounts department and the consumer object to the removal of the offending meter, with its current transformers, to the best position in which the discrepancy can be settled. The rotating sub-standard is, therefore, generally called upon, and corrections are made for the current-transformer errors; but, as the load may vary considerably, the collective error may be very different from that shown by the sub-standard at the time of the test. It therefore becomes necessary to install a check meter for a dial comparison over a period which includes all the usual loads.

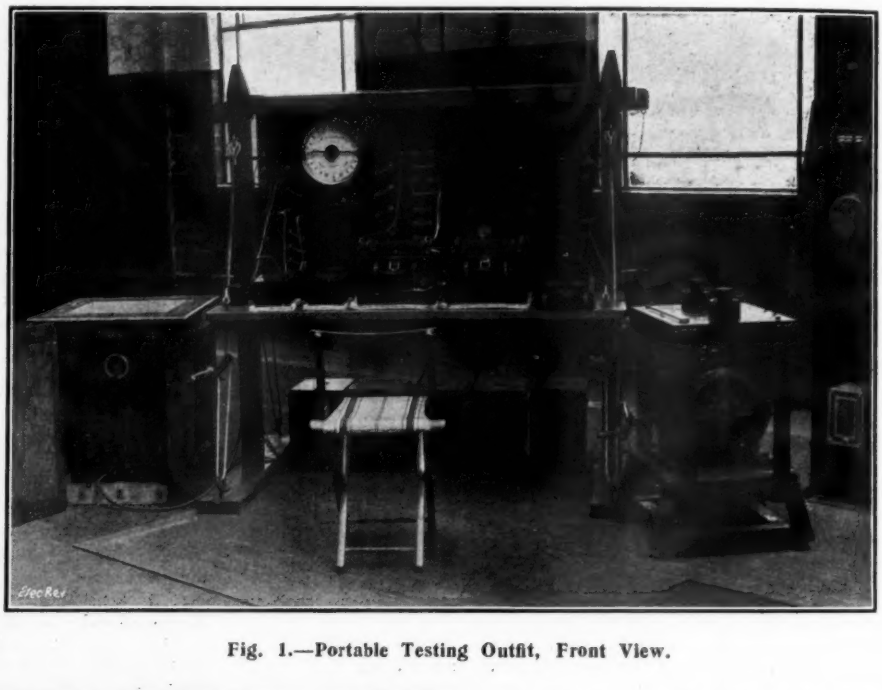


Fig. 1.—Portable Testing Outfit, Front View.

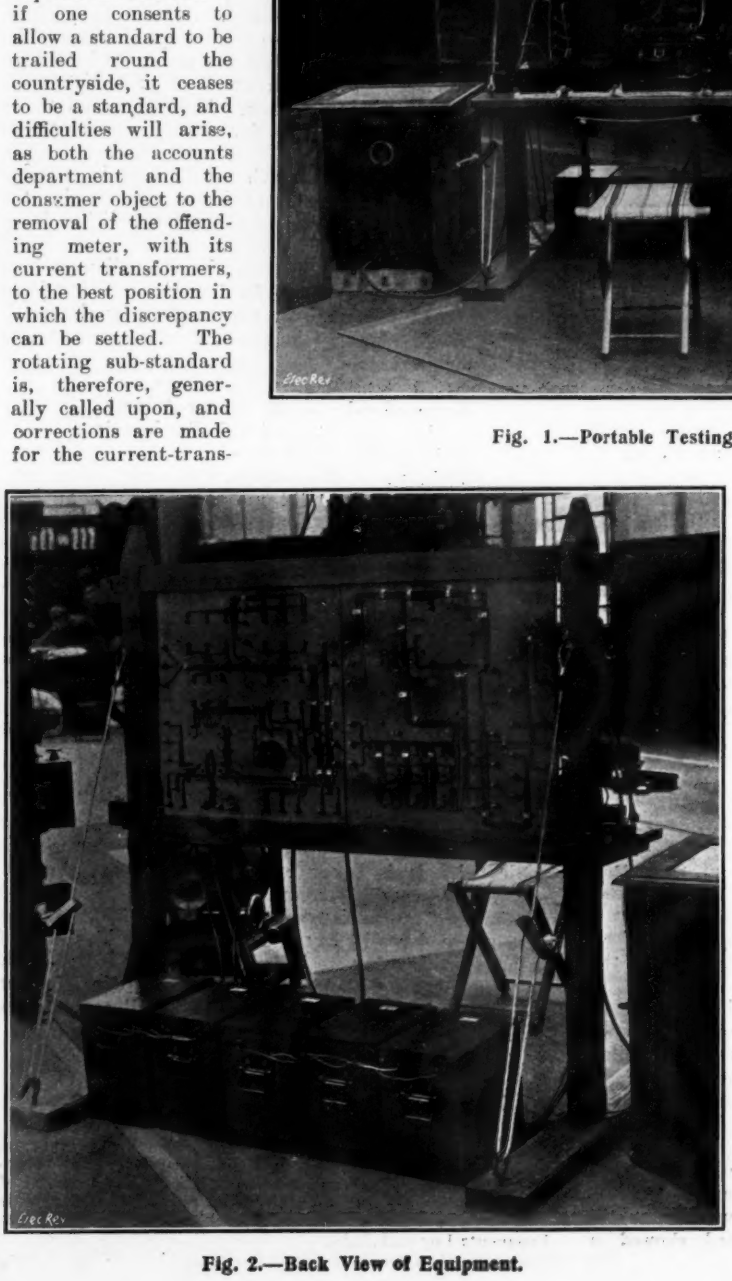


Fig. 2.—Back View of Equipment.

While such a procedure may settle the points in dispute, it leaves the meter engineer in the position of having to remove the meter eventually for re-calibration. The whole question revolves round whether the meter can be moved to the test room, or the test room moved to the job. There are cases, however, in which the cost of removing a meter equipment may be absolutely prohibitive, such as current transformers threaded over super-volt cables which would cost £200 to re-joint, or over a bunch of single-core cables forming one leg of a large power-house generating set. In such cases the meter engineer is coldly invited to make bricks without straw, and console himself with a mental picture of what would happen if one of the transformers' ratios were to become upset.

This state of affairs has now been completely altered by the advent of the double-primary series transformer for meter work. For meter calibration on site, all load and power-factor variations can be artificially imposed on the circuit by having the secondary windings of the series transformers under control, and meter equipments of important generating stations, bulk supplies, &c., can be checked easily

over the whole range with the complete elimination of doubt caused by transport. All series instrument transformers used in the Stourport generating station, whether for relay, ammeter, or wattmeter operation, are so fitted; also the Halesowen control room and many other important metering centres of the Shropshire, Worcestershire and Staffordshire Electric Power Co. The Smethwick generating station is being fitted throughout with similar double-primary transformers on relay and watt-hour-meter circuits. The testing winding is in every case of 2 to 1 ratio for 5-amp. secondaries, and the 10-amp. winding has, within very close limits, the same ratio and phase-angle error as the main primary. Under working conditions both ends are brought out to terminals, of which one is open-circuited and the other earthed.

The author has designed and constructed portable polyphase testing equipment (figs. 1 and 2) which covers the range of any integrating meter, kWh or kVAh, or sine-recording and indicating instruments used in the measurement of electric power and protective gear. It is of 15-A maximum capacity, as 10 A is standard to all series transformers used, and it can be employed in any location where a 400-volt, 3-phase supply is available, at either 50 or 25 cycles. The framework of the bench is in six pieces, the whole being fitted together and tightened by chained wedges and guy ropes, while the table that supports the instruments hooks on beneath the panels and is held horizontally by "Sistoflex" covered-wire supports. Felt pads ½ in. thick are used on the table to absorb any vibration, and the two panels slide in ploughed grooves in top and bottom rails before they are wedged. Each panel is electrically wired complete as a unit, the two being linked when in position by brass rods connecting adjacent terminals. A special packing case is used for housing the panels while in transit, fitted with grooves into which the panels slide side by side, being locked tight when the lid is screwed home. The case is useful on site to time meters which are high up on panels, so that the tester can, by standing on it (fig. 3), look down on the disk spot. The frame of the bench dismantles, together with guy ropes, and packs into a canvas bag with a leather shoe, closed by a reeving cord and kit-bag type of lock, as used in the Army. The loading cabinet is self-contained, with lock and lifting eyes for transit, the three side panels being removable, while ventilation is provided by 3-in. spaces at the bottom of each side and perforated zinc top. This contains 12 fixed resistances, arranged in four groups of three, controlled by four triple-pole switches and a 3-phase variable sliding resistance operated by bevel gears and a hand-wheel from the front. For single-phase work two of each set of three are in series at 24 volts, while for three-phase work each leg works at 14 volts to the star point of the testing windings, which are all earthed on one side; the only thing necessary to change over from 3-phase to single-phase working is the disconnection of one testing winding that feeds from the cabinet terminals.

The phase-shifter, which is arranged for 400/400 volts three-phase, and is rated at 0.5 kVA at unity power factor with 15 per cent. rise in voltage, is mounted on a wooden pedestal with castors and 3-pin interlocked switch plugs for the stator and rotor for plugging into panels of the testing equipment.

The transformers, which are single-phase in wood cases with carrying handles, are fitted with plug sockets under the lids for rapid assembly, the current transformers being arranged for 230/14 volts with an output of 15 A; the pressure transformers are arranged for 400/100 volts, 0.05 kVA, with 2-volt tappings by a selector switch under the lid down to 94 and up to 118 volts.

The testing panels are arranged with frequently-broken circuits, completed by brass rod, so that watt-meters and ammeters can be rapidly inserted, and two-pin plugs across all phases for plugging in pressure circuits quickly. A milliammeter is arranged for plugging into any phase of the phase-changer and, by an arrangement of three-pin plugs, the phase-shifter can be plugged in or out of the test circuit and the milliammeter worked either in primary or secondary. A power-factor indicator is provided, more as a time saver than anything else, so that repeated calculations are avoided, though this is frequently checked against the instruments on the table.

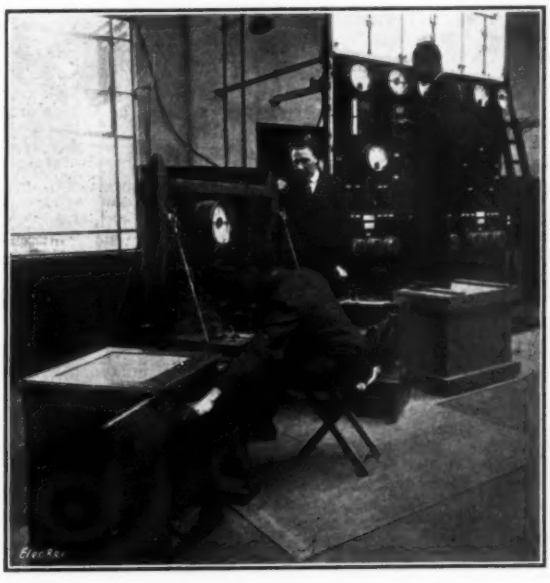


Fig. 3.—Testing Operations in Power House.

All the connections are effected by single-core cab-tire sheathed cables, with plug pins sweated on and coloured. As all wiring and terminals are coloured throughout, the complete equipment can be taken from a small van and assembled for service in less than 15 minutes. The accompanying reproduced photographs show the equipment in operation, testing and recalibrating the panel used to measure and control a 17,000-kW bulk supply. All the instruments, transformers, &c., are suitable for either 25- or 50-cycle circuits.

The equipment is in constant use, either inside or outside the meter test room.

Large Boiler Units.

According to *Power*, the New York Edison Company has placed an order with the Combustion Engineering Corporation for four complete pulverised-coal-fired steam generating units, each having a maximum output of 800,000 lb. of steam per hour. The aggregate of 45,120 sq. ft. of heating surface per unit will, it is claimed, make these the largest units in the world. Each unit is guaranteed to produce 550,000 lb. of steam per hour, but sufficient forced- and induced-draught fan capacity will be installed to permit the operation of the units at peak productions of up to 800,000 lb. of steam per hour. The boilers will be of the double Ladd type, and will be designed for a maximum pressure of 500 lb. and an operating pressure of 425 lb. per sq. in. The furnaces will be equipped with C-E fin tubes in all four walls, fin-tube arch screens and Lopulco water screens. Ten Lopulco, Couch-type burners will be installed in each furnace, five in either side wall. The coal will be fed to the burners by ten Lopulco, type-R feeders. Eight C-E air preheaters will be installed, two for each unit. Each preheater will have a total heating surface of approximately 35,000 sq. ft. The new boilers will furnish steam for the 180,000-kW generating unit now on order, and have been specially designed to fit the limited space conditions and to ensure a steam output of approximately 2,000,000 lb. per hour.

D

Legal.

Marconi Royalties Decisions.

Recently the Loewe Radio Co., Ltd., applied for a compulsory licence under certain Marconi and British Thomson-Houston radio-telephony patents to enable it to manufacture double and triple radio valves under a reduced royalty. The respondents maintained that the royalties should be double or treble those paid on ordinary or single valves, *i.e.*, 12s. 6d.

The application was heard by the Comptroller-General and Assistant-Comptroller of the Patent Office (*vide* Elec. Rev., August 3rd, p. 193), who, last week, delivered their considered decision. This was to the effect that the applicants should receive a licence from the respondents to manufacture Loewe valves in this country and that the royalties should be 7s. 6d. on double valves and 10s. on triple valves, the amount to be paid on other multiple valves to be assessed at the rate of 5s. in respect of the first unitary valve and 2s. 6d. for each additional valve. The Tribunal stated that the royalties proposed to be charged by the respondents, *viz.*, £1 17s. 6d. and £1 5s. on the triple and double valves, respectively, and £3 2s. 6d. on long-range sets, were too high, and were prejudicing the establishment of a new industry in this country. It is noted that not one of the five patents in question was for an invention originating with the Marconi Company, but the latter had gathered them into its own hands and established a kind of "super-monopoly." The respondents had certainly expended large sums of money in radio development, however, and were entitled to some reward. A period of 21 days has been allowed (from August 24th) for the submission of an agreed form of licence. Failing this, an order will be made by the Comptroller-General.

On Monday last the Tribunal issued its decision upon the application of the Brownie Wireless Co. of Great Britain, Ltd., for a licence bearing reduced royalties under certain Marconi patents. The opinion was expressed that the monopoly rights under the respondents' patents had been abused, and it was necessary to consider the question of relief. It was therefore decided that the Brownie Company should be given a licence to manufacture receiving sets under the patents in question, the royalty to be 10 per cent. of the wholesale selling price, with a minimum of 5s. for the first valveholder and 2s. 6d. on each subsequent holder. If the parties could not reach an agreement in the matter, it would be necessary for the Comptroller-General to make an order giving effect to the decision. The Tribunal pointed out that in addition to the specific case before it the general question of the granting of licences on reasonable terms arose, but upon that it was unable to go further than to define the relief to which the present applicants were entitled.

Greenock Corporation v. The Admiralty.

An important stage has been reached in the action in the Court of Session, Edinburgh, by the Greenock Corporation against the Admiralty. The litigation, which has been going on for some time, concerns the heavy expenditure incurred in the installation of plant at the Corporation electricity works, Dellingburn, during the war period. Lord Fleming has now fixed proof to be taken on November 27th, and the Electricity Committee has been given full powers to make the necessary arrangements and to engage any witnesses who may be required. A large sum is involved.

Burnley Components, Ltd., v. Charles.

In the Manchester Chancery Court on August 21st, before Mr. H. Winstanley, the Chancellor's deputy, Burnley Components, Ltd., applied for an interlocutory injunction in an action brought by them against A. C. Charles, Burnley, trading as the Engineering Accessories Co. It was stated for the plaintiffs that they were manufacturers of an electric boiler to which they applied the trade name "Burco." The defendant had issued pamphlets with an illustration similar to the plaintiffs' for advertising a wash boiler of his own, thereby infringing their copyright. He was at one time managing director of the plaintiff company but was now carrying on a competitive business.

In an affidavit the defendant maintained that the plaintiffs did not manufacture the boilers. They purchased them and the necessary electrical apparatus and assembled them as electrically-heated boilers. He said that the illustration in question was reproduced from a standard or common type of boiler and was therefore not an infringement of plaintiffs' copyright. He purchased boilers similar to those bought by the plaintiffs and the illustration had been altered in certain particulars. Mr. Winstanley said that he did not think that any copyright existed in the illustration and the defendant had an equal right with the plaintiffs to its use. He therefore refused to grant the injunction applied for.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A. Factory Lighting Campaign.

The Factory and Workshop Lighting Campaign planned by the E.L.M.A. and being conducted by the British Electrical Development Association is about to commence, and this is therefore an appropriate moment at which to briefly recapitulate the objects and methods of the scheme. As we have already reported (*vide* our issue of August 10th, p. 234), the funds for the campaign are being provided by E.L.M.A., the C.M.A., the E.C.A., and B.E.D.A. and the Electric Light Fittings Association (Industrial Section), and a General Purposes Committee has been formed of representatives of these bodies. In addition, there are sub-committees for publicity, sales and technical matters. Lt.-Col. W. A. Vignoles, D.S.O. (Director and Secretary of the B.E.D.A.) is chairman, and Mr. J. L. H. Cooper (Lighting Service Bureau) is secretary. Under this direction the area committees and circles formed for the previous campaigns will act in their several districts. The *raison d'être* of the Campaign is the fact that 70 per cent. of the factories of this country are badly and inadequately lighted. It follows from this that there is an immense scope for teaching owners and executives the elementary principles of correct lighting, and convincing them of the economic and social advantages of good illumination. The outcome of this should be a demand for more and better lamps, fittings and installations, and consequently for more electricity. The activities of the local circles and district officers will be supported by five successive direct mail letters and educational publications to not fewer than 100,000 factories and workshops; by the circulation of information to those interested in the lighting of specialised trades; by Press advertisements and articles; and by the circulation of better factory lighting literature within the electrical industry. Manufacturers and installation contractors are asked to co-operate with the circles; to assist in organising exhibitions and lecture demonstrations; to lecture if they are able to do so; to instruct their salesmen and engineers in industrial lighting problems; to loan equipment for exhibitions and model factories; to send individual sales letters and make personal calls; to arrange window displays and demonstrations; and put up trial installations wherever possible. The direct mail communications will be as follows: September 10th, letter and booklet, "Electric Lighting for Factories and Workshops"; September 24th, letter inviting applications for the campaign standard specification (which shows the degree of illumination essential in a great many trades); October 8th, an "Industrial Lighting Supplement," by arrangement with the *Illustrated London News;* October 15th, letter and booklet, "Better Factory and Workshop Lighting Pays"; and October 29th, final letter summarising the previous communications and enclosing campaign standard specification. With these letters postcards will be enclosed giving a list of booklets on various aspects of factory lighting. The recipients can return these cards after marking those publications which they desire to have, and further inquiries will be invited. From the replies received a "follow up" list will be compiled so that the individuals concerned can be given further attention.

The desirability of following up the national advertising with personal letters from the local interests is stressed by the organisers.

Unemployment.

There was an increase of 9,230 in the number of unemployed during the fortnight ended August 13th. At that date the total was 1,314,200, as compared with 1,304,970 on July 30th and 1,022,150 on August 15th, 1927.

A New Lamp Works.

A new electric lamp works has recently been established at Strand House, Park Royal Road, N.W.10, by the Helicon Lamp Works Co., a suitable factory having been acquired and equipped, it is claimed, to turn out 3,000 lamps per day. A feature of the production is that every lamp will be tested individually, both before and after sealing, and again after completion. A National Physical Laboratory report on some of the firm's productions shows that a lamp rated at 220 V 100 W gave 89 c.p. for a consumption of 100 W, and one rated at 220 V 60 W consumed 55.4 W on a showing of 49.2 c.p.

Artistic Publicity Matter.

An artistic piece of publicity matter has just been produced by Messrs. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., in connection with their unit pillars. It comprises a series of pictures of these pillars in service in various parts of the world —mainly at home—each of which is accompanied by some

A New Henley Brochure.

notes upon the undertaking concerned. These notes, and also an introduction to the brochure are in four languages—English, French, Spanish and Portuguese—which makes the publication suitable for use in a number of foreign markets. The views are good ones, excellently reproduced, and the three-coloured cover (illustrated herewith) is very attractive.

Another very handsome production has been received from the GENERAL ELECTRIC CO., LTD. This is a brochure describing in some detail the electrical equipment supplied by the company to the Q.M.S.L. *Bermuda* which was dealt with in our issue of December 30th, 1927 (p. 1112). Many parts of the ship are illustrated with excellent photographic reproductions and sufficient notes are given to convey an adequate idea of each feature depicted. A black, gold and puce cover gives the publication an air of distinction.

Australian Copper Development.

It is announced that the Hampden Cloncurry Copper Mines, which until recently held a large interest in Metal Manufacturers Proprietary and the Electrolytic Refining & Smelting Co. of Australia, is to go into voluntary liquidation. The company's holding in Metal Manufacturers Proprietary has been acquired by Imperial Chemical Industries, Ltd., the British Aluminium Co., and the Electrolytic Zinc Co. of Australasia. The *Financial Times* says that Metal Manufacturers Proprietary was formed in 1916 by the Mount Morgan Gold Mining Co., in association with the Hampden Cloncurry Copper Mines, the Electrolytic Refining & Smelting Co., and British Insulated Cables, Ltd.

Syrian Electrical Developments.

Mr. H. E. Satow, British Consul-General at Beyrout, has reported to the Department of Overseas Trade upon the trade, industry and finance of Syria (Stationery Office, 1s. net). He says, *inter alia*, that electrical plant has been, and should continue to be, in greater demand as the installation of electric lighting in various towns and large villages continues. The United Kingdom does not appear to supply any of this material, which comes from Belgium, Holland, Germany, France, and Czecho-Slovakia. The amalgamation of electric light and tramway companies in Beyrout and the Lebanon seems to have resulted in greater activity. Greater use is being made of electricity, and power is to be taken from the Kadisha, in the mountains above Tripoli, to be used for the lighting of that town. As is perhaps only natural, plant for these electrical undertakings, which are only on a small scale, is almost always obtained in France. Extensive developments of the Damascus tramway system are under discussion. These include a line through the "Street which is called Straight," and another line following the north wall of the old city and out to the suburb of Douma. The tramways are operated by a Belgian concern. At Aleppo the tramway and electric light company is working hard. The lines are in large part laid, house-to-house wiring is proceeding, and definite beginnings of the services are expected some time this year.

The telephone service of the country is still managed by the military authorities. The Société Radio-Orient recently concluded an arrangement with the Marconi Co. for direct radio communication between Beyrout and London, which, it is claimed, is cheaper than the cable service. There are also direct services between Beyrout and Paris, Belgrade, Rome, Vienna, Warsaw, Bagdad, and Teheran.

British Generating Plant for Victoria.

The Minister responsible for electrical undertakings in Victoria (Mr. Tunnecliffe) recently explained why the Victorian Electricity Commission had decided in favour of the English Electric Co., Ltd., in considering tenders for generating plant for the Yallourn undertaking. He said that 17 firms submitted tenders, the lowest being from the Continent. As a matter of public policy, however, it was decided to ignore these and consider only the British and Australian offers. This confined the choice to the tenders of the English Electric Co., and Thompson's, Castlemaine. The latter was £6,913 higher than the other but provided for work to the value of £31,900 to be done in Australia. Assuming that no duty would be paid on Thompson's tender, the price amounted to £54,968. Excluding £14,816 duty from the English Electric Co.'s tender the figure became £34,234, exclusive of the cost of erection. Moreover, the acceptance of the Australian offer would have involved an additional annual expenditure of £1,900 owing to the lower efficiency of the plant; this, capitalised at 5 per cent., represented £38,200. In other words, the actual capital cost of the Australian plant would be £89,800, against £51,600 for the English plant. Thus to obtain the expenditure of £31,900 in Australia the Commission would have to pay about £38,000.

The Melbourne *Argus* reports that local trade unionists have announced their intention of refusing to handle the plant upon its arrival in Australia.

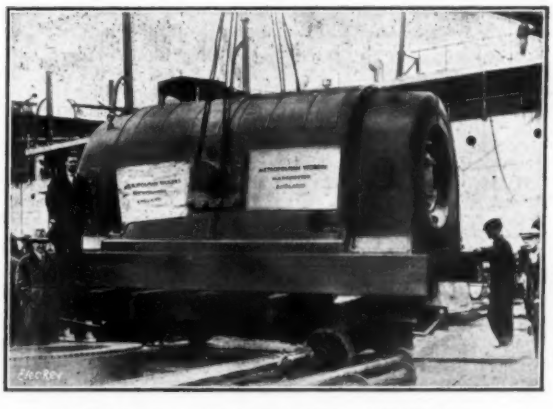
Recent Contracts.

About a year ago the Leicester Corporation ordered two Howden-Ljungström air preheaters to operate in conjunction with two existing boilers at Freeman's Meadow Power Station. The results obtained from that installation have been so satisfactory that the Corporation has placed a repeat order with Howden-Ljungström Preheaters (Land), Ltd., for preheaters for four further boilers. At the same time the Corporation has ordered the same make of preheater for pulverised fuel fired boilers now under construction for the new extension to the power station.

The Great Western Railway Company has placed an order for the supply, delivery, and erection of four electric capstans for the King's Dock, Swansea, with MESSRS. RANSOMES AND RAPIER, LTD. It has also ordered a 50-ton overhead electric travelling crane from MESSRS. S. H. HEYWOOD & CO. for Old Oak Common.

A Large "Metrovick" Set for Belfast.

We reproduce herewith a photograph of the last 18,750-kW turbo-generator for the Belfast Corporation being landed. This stator, which weighs 54 tons, is the heaviest piece of machinery which has come into Belfast for transport. It was lifted out of the boat by the Harbour Board's 120-ton crane and hauled



Landing an 18,750-kW Stator at Belfast.

by traction engine to the site, about three-quarters of a mile along the dock; the whole of the road had to be plated, and it took from 1 p.m. one day until 5 p.m. the next to get it into the station. This unit brings the total capacity of "Metrovick" turbo sets supplied to the Belfast Corporation up to 50,000 kW.

Bankruptcy Proceedings.

O. C. Lay, trading as the Home Wireless Installation Co., High Street, Wandsworth, S.W., accumulator specialist.—The first meeting of creditors was held recently at 29, Russell Square, W.C.1, when the case, being a summary one, was left in the hands of the Official Receiver as trustee. A statement of affairs was presented which showed liabilities of £572 against assets of £77, leaving a deficiency of £495. The debtor commenced business as a wireless dealer and accumulator charger at his present premises in 1923, with £75 borrowed from friends, and at first was successful. In December, 1926, he took another shop, again borrowing from friends, but the demand for wireless apparatus declined and his business gradually fell off. In July a meeting of creditors was held, and a statement submitted showed trade assets of £44 and liabilities of £510. An offer of 2s. 6d. in the £ was not accepted by the creditors. Debtor stated that he became aware of his position in May last and attributed his failure to lack of capital, heavy overhead charges, profitable trade only during winter months, bad debts, and depreciation of stock. The following are creditors:—

	£		£
Brown Bros., Ltd. ...	21	Portable Electric Light Co., Ltd.	22
Dew, A. J., & Co. ...	114	Philips Lamps, Ltd. ...	23
Enterprise Mfg. Co. ...	28	Sun Electrical Co., Ltd.	61
General Electric Co., Ltd.	58	Lay, J.	30
Martison, W., & Co. ...	32	Couchman, H. A. ...	26

E. D. Jones, Portmadoc, Carnarvon, electrical engineer.—The receiving order herein was made recently on the debtor's own petition, and the first meeting of creditors was held recently at the Official Receiver's office, Chester. The following are creditors:—

	£		£
Briggs, James, & Co. ...	22	Hollingdrake, H., & Son, Ltd.	208
Dominion Rubber Co., Ltd.	22	Metro-Vick Supplies, Ltd.	41
Houghton-Butcher, Ltd.	50	Simpson, Baker & Co. ...	27
Jones, Mrs. S. A. ...	605	Shaw, E. J., & Co. ...	28

J. A. Davies, Church Street, Blaenau Festiniog, Merioneth, electrical contractor.—The receiving order in this matter was made recently on the debtor's own petition, and the first meeting of creditors was held recently at the Official Receiver's office, Chester. The following are creditors:—

	£		£
Brandes, Ltd.	83	Beardswell, Ltd., W. E.	54
Falk, Stadelmann & Co., Ltd.	38	Metro-Vick Supplies, Ltd.	38

W. J. Beaty, 79, Station Road, Ashington, Northumberland, electrical and wireless dealer.—The public examination herein was held on August 23rd, at the Court House, Newcastle-upon-Tyne, when the matter was adjourned, the debtor being instructed to furnish a cash account showing transactions between June, 1927, and June, 1928. Debtor stated that in 1925 he commenced business as an electrical and wireless dealer. He admitted that he had only kept one account book.

S. S. Kelly, 59, North Road, Durham, electrical contractor.—This debtor's public examination was held on August 21st at the County Court offices, Durham, when the case was adjourned. The debtor returned a statement of affairs showing a deficiency of £1,411, and stated that a year ago his liabilities exceeded his assets by £1,256. He had borrowed from two moneylenders, agreeing to pay 50 per cent. interest.

Emily Keable, E. Keable, and H. J. Nash, plumbers and electrical engineers, 3, Church Street, Bexhill.—First and final dividend of 4s. 10½d. in the £, payable August 28th at the Official Receiver's office, 12a, Marlborough Place, Brighton.

H. Osborn, 3, High Street, Normanton, Yorks., wireless dealer.—Last day for receipt of proofs for dividend September 8th. Trustee, Mr. B. S. Briggs, Official Receiver, County Chambers, King Street, Wakefield.

William Yorath Lewis, The Clock House, Arundel Street, Strand, W.C.2, engineer.—First and final dividend of 2s. 0½d. in the £, payable September 3rd, at 10, Serjeants' Inn, Fleet Street, E.C.4.

E. J. G. Hurles, 119, Cambridge Road, Teddington, and 8, Blackfriars Road, S.E., wireless dealer.—Receiving order made August 15th on a creditor's petition. First meeting held August 28th; public examination October 26th, at Carey Street, W.C.2.

E. R. D. Lindsay, 96, Victoria Road, Aldershot, wireless and cycle agent.—Receiving order made August 17th on debtor's own petition. First meeting held August 29th; public examination October 2nd, at the Guildhall, Guildford.

H. Gateshill, 113, Witham, Hull, wireless engineer.—Receiving order made August 16th, on debtor's own petition. First meeting September 4th, at the Official Receiver's office, 37, Scale Lane, Hull. Public examination October 15th, at the Guildhall, Alfred Gelder Street, Hull.

B. E. M. Pook, 53a, Albert Road, Southsea, Portsmouth, wireless dealer.—First meeting to-day (Friday) at the Official Receiver's office, 87, High Street, Portsmouth. Public examination October 1st, at the Court House, St. Thomas's Street, Portsmouth.

N. Jawett, 58, Bedford Street, E.1, electric lamp dealer.—Receiving order made August 22nd.

A. C. Cooper, 1a, Sherwood Street, Scarborough, electrical engineer.—Last day for receipt of proofs for dividend, September 5th. Trustee, Mr. D. S. Mackay, Official Receiver, 48, Westborough, Scarborough.

Company Liquidations.

Manufacturers' Accessories Co., Ltd., 85, Great Eastern Street, E.C., electrical and wireless accessory dealers, &c.—A meeting of creditors was held at the Midland Grand Hotel, St. Pancras, on August 20th, when Mr. E. H. Hawkins (Messrs. Poppleton, Appleby & Hawkins, I.A., Charterhouse Square, E.C.), one of the joint liquidators, presided. The other liquidator is Mr. W. A. J. Osborne, Finsbury Pavement, E.C. A statement of affairs as at July 6th last was presented, which disclosed liabilities of £27,412, of which £17,421 was due to unsecured trade creditors. There was a liability under lease amounting to £500, and unsecured loan creditors' claims amounted to £9,491. In addition, there was a sum of £8,500 shown for debentures and interest, including the estimated costs of the receivership. The net assets were £8,976, leaving a deficiency of £18,436. The company was registered in 1907 with a nominal capital of £3,000. After giving trading figures for the past six years, Mr. Hawkins said that Mr. Vincent, the receiver for the debenture holders, had been in negotiation for the past three weeks with a view to disposing of the business. It was hoped that it would be sold as a going concern. The greater part of the deficiency was explained by the debit to profit and loss account and the remainder was accounted for by the writing-down of assets. The creditors resolved that the appointment of Mr. Hawkins and Mr. Osborne as joint liquidators should be confirmed. An informal committee of inspection was also nominated, consisting of the representatives of the Dunlop Rubber Company, Edison Bell, Ltd., Mullard Wireless Service Co., Ltd., Rankin Bros., Lucas Lamps, Mr. C. Latham, representing creditors, and Mr. M. Lintine representing cash creditors. The following are among the principal creditors:—

	£		£
Böhmische Gluhlampenwerke A.G. ...	141	Graham Amplion, Ltd.	100
British Thomson-Houston Co., Ltd.... ...	105	Hunt, A. H., Ltd. ...	158
Coventry Chain Co. ...	125	Lucas, Joseph, Ltd. ...	429
Chloride Elec. Storage Co., Ltd.	170	Lodge Plugs, Ltd. ...	258
Cossor Valve Co., Ltd.	167	Markt & Co. (London), Ltd.	124
Edison Bell, Ltd. ...	1,283	Mullard Wireless Service Co., Ltd. ...	524
		R.I. & Varley, Ltd. ...	167

Uneeda Supplies Co., Ltd., 37, Tothill Street, S.W.1, wireless and electrical dealers.—A meeting of creditors was held on August 20th at the offices of Messrs. Haynes & Baker, 93, Mortimer Street, W.1, when the chair was taken by the liquidator, Mr. W. F. Baker, who presented a statement of affairs which disclosed liabilities of £6,753 and assets at book value of £5,271. The liquidator reported that under a forced realisation the assets would not fetch anything like the amount shown. The company was formed in June, 1926, with a nominal capital of £1,000, and had offices at Bank Chambers, High Holborn. In December, 1926, the business was removed to Petty France, and subsequently, two months ago, to the present premises. The issued capital of the company was £950 and the shares were held by Messrs. E. Batty, J. Bolton, T. F. Shearer, and L. C. Green. A debenture for £1,000 was created in April, 1927, for cash advanced, and one for a similar amount in May of this year in favour of Mr. Batty in consideration of his guaranteeing payment of certain sums for goods supplied by continental manufacturers; that debenture would not rank. The trading loss for the fifteen months to the date of liquidation was £1,428. Mr. Baker added that in addition to being appointed liquidator he was also receiver for the debenture holders. He was making efforts to sell the business as a going concern but had so far been unsuccessful. It was decided that the voluntary liquidation of the company should be continued with Mr. Baker as liquidator, with a committee of inspection.

Burndept Wireless, Ltd.—A resolution for voluntary liquidation was passed at a meeting on August 21st. Mr. R. A. Hamlyn, 80, Bishopsgate, E.C., was appointed liquidator, and he was authorised to consent to the registration of a new company, to be named Burndept Wireless (1928), Ltd., and to enter into an agreement with the said new company. A meeting of creditors is called for September 7th at the liquidator's offices, and particulars of claims are to be sent to the liquidator by October 2nd.

Manchester Magneto Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. Linley Price, 8, Exchange Street, Manchester, appointed August 16th. Meeting of creditors at the liquidator's office, September 5th. Particulars of claims to be sent to the liquidator by October 18th.

Ridgway Storage Battery Co., Ltd.—A meeting of creditors was to be held on August 28th.

Rudolf Charles & Goff, Ltd.—A meeting of creditors is called for to-day (Friday) at the Institute of Chartered Accountants, Moorgate, E.C. Particulars of claims to be sent by October 1st to the liquidator, Mr. F. Hyde, 34, London Wall, E.C.2.

Neutron, Ltd., Sentinel House, Southampton Row, W.C.—Last day for receipt of proofs for dividend September 4th. Liquidator, Mr. M. D. Booth, 40-43, Norfolk Street, Strand, W.C.2.

Pearl Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. W. Archibold, 72, Leadenhall Street, E.C.3, appointed August 2nd.

Pearlotone Amplifier Co., Ltd.—A meeting is called for September 22nd at the offices of Messrs. Corfield & Cripwell, 119, Finsbury Pavement, E.C.2, to hear an account of the winding up from the liquidator, Mr. W. A. J. Osborne.

Trade Announcements.

Mr. W. A. Gazard, late of Erdington, has opened an electrical and wireless showroom in Stechford Lane, Birmingham, under the name of the Stechford Electrical Depot; telephone: "313 Stechford."

Messrs. A. D. Fattelay and F. R. Woodhatch have acquired, as from August 7th, the goodwill and stock of Woodfield's Electric Service, 47, Manchester Street, W.C.1. They have been instructed to collect all debts due to the late proprietor, Mr. H. V. Woodfield, who will pay all debts outstanding at the date of transfer.

Book Notices.

"Electric Cooking and Food Preservation." By Dorothy Vaughan and A. H. Hunter.—This little book, published by the Electrical Association for Women (price 4d.) contains much information of practical value to housewife, cook, and so on, and is a reprint of three lectures given before the Association.

"The Woman Owner-Driver," by the Hon. Mrs. Victor Bruce. Pp. 53; illustrated. London: Iliffe & Sons, Ltd. Price 1s. 6d. net.

"Letters to an Absentee Director," by J. Lee, C.B.E. Pp. ix+102. London: Sir I. Pitman & Sons, Ltd. Price 5s. net.

Foreign Wire Ordered by the Post Office.

It was announced last week that the General Post Office had placed an order for a year's supply of bronze wire with a French firm, the Tréfileries du Havre. In an official statement, made to justify its action, the Post Office stated that the Select Committee on Estimates, in its recent report, said that there was a "ring" in this country which maintained high prices, and that the Post Office should have a free hand to accept foreign tenders if British prices were excessive. In the present case the British makers' prices for bronze wire, as well as for copper wire, compared very unfavourably with the foreign offers. Nevertheless, the Post Office did not place the order abroad until it had made every effort to induce a British firm to quote a reasonable price, and it even suggested a price, allowing a substantial margin over the Continental tender, at which it was prepared to place the contract. In a reply to this statement Mr. Llewellyn B. Atkinson, director of the Cable Makers' Association, said that it was not true, as a general statement, as had been suggested, that his Association quoted lower prices to Dominion buyers. The Post Office demanded to be charged the lowest prices charged anywhere in the world, and the Association could not compete with foreign firms on that basis. An official of a large firm of manufacturers said that for years they had been making sacrifices to the Post Office for the sake of peace, but now they had reached the absolute limit. For a long time they had been getting nothing at all out of Post Office contracts, and they could not compete with the French prices. The Post Office was obsessed with the entirely erroneous idea that because there was an Association prices were forced up.

The Buenos Aires Telephone Tariff.

Referring to the recent decision of the Argentine Government to reduce the rates charged by the United River Plate Telephone Co., the Buenos Aires correspondent of the *Financial Times* says that although the company has made a strong protest, the reduction will be carried into effect. The increase which it is proposed to discontinue was granted in 1922, when the cost of installation and extension was much higher than it is at present. The authorities maintain that the profits of the undertaking exceed 8 per cent. upon the authorised capital, and that they are therefore justified in ordering the reduction. Our contemporary states that the company certainly has just ground for complaint in the manner in which the reduction has been suddenly ordered. Mr. Percy Cross is on a visit to Buenos Aires in order to meet the authorities and endeavour to arrive at a friendly agreement.

Better Prospects in China.

The *Financial Times* says that one of the most heartening features of the industrial outlook for Britain to-day is the prospect of a revival of trade with China, which is expected in well-informed circles in London. This is likely to take definite form within a very short time, for it is understood that a syndicate of manufacturers with interests in every department of British trade has been formed expressly for the purpose of reconstructing China's war-ravaged areas. Many world-famed firms are in the syndicate and huge contracts will, it is stated, be signed. Contracts will be offered for the reconstruction of thousands of miles of railway and the development and reconstruction of roadways. There will be orders for motor and mechanical transport, bridges, public utilities, harbours and all types of iron and steel constructional work. Events in China have in the past year militated against British trade, but since the Tsinanfu incident there has been a reaction and in reliable quarters it is stated that Britain is now making great trade headway in the Far East and capturing much of the trade formerly held by the Japanese.

New Catalogues and Lists.

The Tungstone Accumulator Co., Ltd., 3, St. Bride's House, Salisbury Square, E.C.4.—A well-illustrated catalogue of various patterns of "Tungstone" accumulators.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—Publication No. 39, illustrating and describing c.t.s. flexibles with Heald cord strengtheners.

Messrs. H. W. Sullivan, Ltd., Leo Street, Peckham, S.E.15.—Two copiously illustrated catalogues of electric fires and cookers for the 1928-29 season. Priced.

Messrs. S. G. Brown, Ltd., Western Avenue, North Acton, W.3.—The "Brown Budget" for August, containing illustrations, particulars and prices of the company's loud speakers, microphones, gramophone pick-ups, &c.

Messrs. Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—A folder illustrating and describing an a.c. bell of substantial design. Priced.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—A well-illustrated brochure describing the power transformers recently supplied for the new Longford station of the Coventry Corporation.

Messrs. J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham.—A priced and illustrated folder dealing with the company's iron switch boxes, fitted and unfitted.

John Thompson Water Tube Boilers, Ltd., Imperial House, Kingsway, W.C.2.—A folder containing many illustrations of the company's works and products.

B.E.N. Patents, Ltd., 92, Tottenham Court Road, W.1.—A list of users of the "B.E.N.-Myers" hydraulic car washer.

Private Arrangements.

A. H. Bryn, electrical and wireless dealer, 14, Queen's Arcade, Cardiff.—A meeting of creditors was held recently when a statement of affairs as at August 9th last was submitted, showing liabilities of £612 and net assets of £330, leaving a deficiency of £282. Prior to commencing on his own account the debtor was manager of a firm which went into liquidation and he claims that he lost a considerable sum by reason of his association with that business. In partnership with another person who had also been in the employ of the concern which liquidated, the debtor then commenced the present business, but this partnership was dissolved by mutual consent in 1925 and his partner's capital of £120 was repaid. In June, 1927, the premises were entered by burglars and stock was stolen to the value of £37 which was not covered by insurance. Later the debtor met with an accident and was confined to his house for six weeks, during which the business suffered materially. It was decided that the debtor should be given seven days within which to make an offer of 10s. in the £ in cash or suitable guarantees to be found. It was also decided to confirm the deed of assignment already executed to Mr. C. S. Lashmore, Cardiff. The following are creditors:—

	£		£
General Electric Co., Ltd.	51	Electric Agencies, Ltd. ...	37
Hardwick, C. J.	50	British Thomson-Houston Co., Ltd.	36
Ericsson Manufg. Co. ...	45	Revo Electric Co., Ltd.	36
Brown Bros., Ltd. ...	39		

F. G. Morritt, trading as Atkins & Powell, 48, Thames Street, Windsor, electrical and wireless engineer.—A meeting of creditors was held on August 15th, when it was reported that the liabilities amounted to £956, while the assets were estimated at £404, leaving a deficiency of £552. The debtor started trading in July, 1926, with £200 borrowed money, the business being purchased from a former employer for £560. Of the purchase price £100 was paid on account and an arrangement was entered into to discharge the balance by instalments of £10 per month. There is now £300 owing under this agreement. Another business was purchased in October, 1927, but this concern was closed down subsequently at a loss of about £150. A further business at Old Windsor was started in the same year, but this was closed down last spring. The books of account showed that the debtor's total receipts from July, 1925, to August, 1928, were about £4,100. His drawings had been about £4 10s. per week and the profits did not seem to have covered the drawings. It was decided to confirm a deed of assignment already executed to Mr. Frederick Kidson and an endeavour is to be made to sell the business as a going concern.

A. R. Colborne, 66, Newport Street, Swindon, electrician.—Owing to a pressing claim by a creditor who had actually levied execution, Mr. Colborne, on August 13th, executed a deed of assignment for the benefit of his creditors, and Mr. E. C. Fielder, High Street, Swindon, was appointed trustee. Mr. Fielder has paid out the execution amounting to £66 in order to preserve the assets, and a meeting of creditors was held at the offices of Messrs. Townsend, Wood & Calderwood, 42, Cricklade Street, Swindon, on August 24th. A statement of affairs submitted showed liabilities of £572 and net assets of £445, leaving a deficiency of £127. It was resolved to confirm the deed of assignment subject to the appointment of Mr. E. H. Hawkins as additional trustee, and it was also provided that Mrs. and Miss Colborne should withdraw their claims. The following are creditors:—

	£		£
Falk, Stadelmann & Co.	31	General Electric Co., Ltd.	67
Z Elec. Lamp & Supplies Co., Ltd.	85	Johnson, Walter	97

Glasgow Corporation Showrooms and Offices.

The Corporation Committee on the Reorganisation of the Electricity Department has recommended that the proposal to convert the ground floor of the Waterloo Street property into showroom premises be approved generally and that the premises belonging to the department in Sauchiehall Street be disposed of. It is also proposed that the manager report on the present office accommodation in Waterloo Street and as to any alterations that might be made.

Jugo-Slavian Cable Contracts.

With reference to the proposed large deliveries of telephone cables to the Government of Jugo-Slavia, it is stated that the Government at Belgrade has not adopted the recommendation of a committee which was appointed to consider the offers sent in and which suggested that the orders should be divided between the English Standard group and the German Siemens group. The Government has invited representatives of the two competitive groups to enter into further negotiations, mainly regarding the conditions of the loan which both groups have offered for the financing of the work. The value of the deliveries is stated to amount to between six and seven million dollars (?).

German Wire Association.

It is now proposed to continue negotiations with a view to the re-constitution of an association for conductor wires in Germany. In principle there is agreement as to the necessity for the formation of a price convention, but the question as to what form this should take has not been cleared up. In the meantime prices remain depressed owing to underselling on the part of some firms.

A Swedish-Russian Company.

The Allmänna Svenska Elektriska A.B. has formed a subsidiary, under the title of the Svenska Elektrokoncessionen, in Soviet Russia, to take over the agreement concluded between the former and the Soviet Government in May, 1927, for the manufacture and sale of electrical machines, apparatus, &c. The share capital is to be a minimum of 10,000,000 kr. and a maximum of 30 millions, and the headquarters of the company will be at Vasteras, Sweden. The new company will take over the works and plant at Yaroslav, Russia, established by the parent concern.

Bulgarian Import Duties.

The *Board of Trade Journal* states that among the goods which are exempted from the increased duties recently imposed upon goods entering Bulgaria are the following: Dynamos, motors, transformers and parts; telegraph and telephone apparatus, electrical measuring apparatus and heating apparatus; electric cables and wires; materials for electrical installations; and tramway carriages. These will continue to be subject to the duties at the rate of 15 paper levas to the gold leva.

Dissolution of Partnership.

Sweetman & Ansell, electrical and mechanical engineers and contractors, 3, Bell Street, Reigate.—Messrs. J. Sweetman and A. Ansell have dissolved partnership. Debts will be attended to and the business continued by Mr. Ansell.

Great Britain's Radio Exports.

The *Wireless Trader* publishes details of exports of radio apparatus from this country during the first half of the current year. From these it is seen that the total value was £586,322, as compared with £643,938 in the first six months of 1927. Our leading customer was again Australia, but its share declined from £124,950 to £76,332. Japan fell from second to third place; in this instance, too, there was a large decrease—from £103,181 to £45,383. A large increase—from £25,419 to £46,226—placed France second in the list. Other important customers were the Netherlands (£37,281 against £35,055), South Africa (£33,281 against £10,526), India and Burma (£30,966 against £43,924), the Irish Free State (£22,622 against £13,937), New Zealand (£20,397 against £33,022), Bulgaria (£19,802 against £63), and Belgium (£18,348 against £9,191).

Proposed Russian Sales Syndicate.

The General Electrical Commission has put forward a scheme for the formation of a general syndicate for the electrical industry. It is suggested that sales should be concentrated in the new syndicate, which would also deal with the supply to the manufacturing works of raw materials and semi-finished materials from home and foreign firms.

New French Company.

La Compagnie des Câbles et Matériels Electriques G. Bouchery is the name of a company which has been formed in Paris (49-51, Rue Chabrol), with a capital of ten million francs, to acquire and carry on the Bouchery electric cable works.

A Japanese Electrical Amalgamation.

We are informed that an amalgamation of three Japanese electric power companies—the Shinetsu Electric Power Co., the Toho Electric Power Co., and the Kwanto Hydro-Electric Power Co.—has been approved, and is to be completed shortly. The organisation probably will be named the Tokio Electric Power Co., and will be controlled by the Tokio Electric Light Company.

Unemployment in the United States.

In the course of the speech in which he accepted nomination as a candidate for the Presidency of the United States, Governor Alfred Smith declared that there were 4,000,000 men out of work in the United States, that certain industries were wholly prostrate, and that there was a widespread business difficulty among individual business men in the country.

Pinchin, Johnson in Australia.

It is announced from Sydney that Messrs. Pinchin, Johnson and Co., Ltd., have acquired the business of paint and varnish manufacturers carried on in Australia by Borthwick Proprietary.

Germans Acquire Swedish Company.

It is reported that the Elektra Works Company of Stockholm, has been acquired by the Osram Lamp Company, Germany. The purchase price is stated to be 400 kr. per 250 kr. share. The Elektra Company's capital was recently reduced from 5,000,000 kr. in 500-kr. shares to 2,500,000 in 250-kr. shares.

Prices of Raw Materials.

Messrs. F. Smith & Co., and Messrs. James & Shakespeare report, August 28th: No change in copper prices.

Messrs. James & Shakespeare report, August 28th: English pig lead, £23 10s., 10s. inc.

Messrs. Edward Till & Co. report, August 28th: India-rubber, Para fine, 11¼d., ¼d. inc.

In their letter dated August 24th Messrs. James Forster and Co. stated that towards the end of last week, with leading interests bidding for August-September lead, and reports of curtailed arrivals for these two months, the tone was decidedly better and a considerable covering business was done up to the above figures, with sellers rather than buyers. Business on the Metal Exchange last week was chiefly professional, consumers being little in evidence. America has advanced the official price 10 points, to 6.30. The better tone is largely due to uncertainty as to the outcome of the World's Producers' Conference to be held next month, and is in no way due to increased demand for lead in this country, at any rate for consumption.

Lighting and Power Notes.

Australia.—Brisbane.—At a recent meeting the Brisbane City Council approved a further expenditure of £178,000 for extensions to the power station, including the installation of a third generating set of 18,000 kW, which is required before 1930. It was also stated that another similar set would become necessary by 1934.—*Tenders.*

Tasmania.—Lord Somers, the Governor of Tasmania, in his speech opening Parliament on August 22nd, said the operations of the Hydro-electric Department continued to expand, and negotiations were in progress for the development of tin-fields in North-East Tasmania, which, if successful, would justify the extension of hydro-electric power. The Government was anxious to secure the establishment of industries with cheap power, and this, in addition to climatic and other advantages, should be of sufficient importance to induce manufacturers to establish their industries in Tasmania. —*Reuter* (Hobart).

Brazil.—Hydro-Electric Development.—The tramway system and the local electricity supply plants of Curityba, the chief town of the Brazilian State of Parana, are operated by the Southern Brazil Railways Co. The electricity supply is said to be inadequate for lighting purposes, and the municipal authorities have consequently plans in hand for a hydro-electric installation at a waterfall about 45 miles distant from the town.

Colwyn Bay.—Year's Working.—The accounts of the Urban District Council's electricity undertaking for the past year show that the consumption of electricity increased by 19 per cent. as compared with the preceding year, while the revenue increased by over £3,000. The bulk supply from the North Wales Power Company cost £11,000, and other items brought the total expenditure to £17,770. The gross profit was £11,000, or 8 per cent. on the capital outlay, and 22 per cent. on the present outstanding loan liability, and after meeting loan charges and income-tax the net profit was £3,247. The existing surplus is £5,895, and it is the Electricity Committee's aim to build it up to £12,500.

Continental.—France.—La Société de l'Energie Electrique du Rouergue has secured a concession to establish a 60,000-V overhead transmission line between Lentin and Thurils in the Department of the Tarn.

Erith.—Year's Working.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. J. C. Williams) for the year ended March 31st last record a total income of £69,818, and working expenditure of £49,770, leaving a gross profit of £20,048. After providing for capital charges, a net surplus of £10,744 remained. The sales of electrical energy amounted to 12,452,618 kWh, and the maximum load was 1,900 kW.

Glasgow.—YEAR'S WORKING.—We have received a copy of the Electricity Committee's report on the working of the Corporation electricity undertaking, together with the statement of accounts covering the year ended May 31st last. The total revenue amounted to £1,440,679, as compared with £1,391,101 in the preceding year, and working expenses decreased from £806,328 to £610,136, leaving a gross profit of £830,543, as against £584,773. Interest on loans absorbed £282,957, and sinking fund charges accounted for £295,482, leaving a balance on the year's working of £252,104. Against this, however, depreciation according to previous years' percentages amounting to £127,926, and special depreciation in connection with Dalmarnock station, mains and garages totalling £95,645, had to be deducted. The final result, therefore, was a surplus of £28,533. There was a deficit in the preceding year of £97,304. The capital expenditure during the year amounted to £395,413, and included £68,593 for h.p. feeders, £149,375 for mains and services, and £44,951 for changing over from d.c. to a.c. The total expended on the undertaking, less depreciation written off, at the end of the year under review was £8,352,849. The electrical energy generated increased from 233,672,352 to 267,677,400 kWh, and the total sales from 191,789,688 to 220,247,598 kWh. The maximum supply demanded rose from 90,000 to 107,220 kW, and the total connections from 254,228 to 277,216 kW. The cost per kWh generated decreased from 0.7257d. to 0.4243d., the lowest yet recorded in the history of the department (mainly due to a fall in the cost of fuel from 0.3949d. to 0.1491d. per kWh), and the average price obtained per kWh fell from 1.7408d. to 1.5699d. Seven new sub-stations were put into commission during the year, and approximately 20 miles of h.p. and l.p. feeders and 38 miles of distributor cables were laid.

TRANSMISSION LINES.—The Corporation has now arranged terms with regard to carrying through the city from the Dalmarnock power station to Port Dundas and Yoker power stations the main transmission lines, which are to be constructed under the terms of the Central Scotland scheme.

MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised extensions of distributing mains at a cost of £4,800.

PROGRESS DURING JULY.—Under the Corporation Electricity Department scheme 134 houses were wired in July, making the total to date 8,632, while applications for the hire of appliances numbered 115, making the total 19,911.

Hungerford.—STREET LIGHTING.—The Parish Council has accepted the offer of the Wessex Electricity Co. for public lighting for a period of six years by 46 lamps, at £170 per annum. The Wessex Co. has taken over from the liquidator the undertaking of the Hungerford Electricity Supply Co.

Korea.—ELECTRICITY SUPPLY.—The *Financial News* reports that the Chosen Syndicate, Ltd., has announced that an important arrangement for an adequate supply of electrical power to its properties has been concluded with the Shimada Syndicate under the guarantee of the Chosen Denki Kabushiki Kaisha (an important semi-Government organisation), owning one of the most up-to-date generating stations in the Japanese Empire, situate about 98 miles from the property. Preliminary construction work on the transmission line has already started, and power is expected to be available about April next.

Lincolnshire.—RURAL ELECTRICITY SUPPLY.—According to the *Yorkshire Post* the electrification of the rural districts of Lincolnshire was discussed at a recent meeting of the Spilsby Rural District Council, in connection with a letter which had been received from the Boston and District Electric Supply Co., Ltd., referring to an application that the company is making for an Order to supply Skegness and some of the parishes in the Spilsby area. The Council's Electricity Committee reported that it had considered the draft order which covered the urban district of Skegness and certain parishes within the Rural Council's area. It had informed the County Council that it viewed with considerable apprehension those individual applications for powers to supply the more remunerative parts of the county with electricity, to the detriment of the less productive portions. The Committee had now received an intimation that the Lindsey County Council had lodged an objection against the Boston draft Order, and the Committee had also lodged an objection on the grounds that the proposed supply area in the draft Order was also covered by the Lincolnshire Electricity draft Special Order, now before the Electricity Commissioners. Under the Lincolnshire Order it was proposed to supply electricity to the greater portion of the Council's area, but the supply on reasonable and profitable terms to the whole area would in the opinion of the Committee be prejudiced if the populous area scheduled in the Boston Order was taken out of the Lincolnshire Order. The Committee asked the Commissioners to give consideration to the probable effect on the Lincolnshire scheme of the omission therefrom of Skegness and the parishes mentioned. It thought the Council should seize the opportunity of appearing at any inquiry held regarding the Boston Order. It was decided that the Electricity Committee should meet the representatives of the villages concerned to decide whether they were entitled to a separate supply, and that the manager for the Boston scheme should also be asked to attend the conference.

Market Drayton.—STREET LIGHTING.—The Urban District Council has accepted the offer of the Market Drayton Electric Light Co. for public lighting during the ensuing season at £3 10s. per lamp.

Morecambe.—FAILURE OF SUPPLY.—The premature switching-on of the Corporation's scheme of autumn illuminations caused a failure in the supply of electricity in Morecambe and Lancaster on August 24th, lasting for nearly two hours. The illuminations were due to be put into operation on August 25th, but, according to the *Daily Dispatch*, by some error instructions were given to the contractors to switch on the illuminations, without authority from the Morecambe borough electrical engineer, and without notifying the district power station at Lancaster. The unexpected load put the plant out of action.

SUPPLY TO HOUSING ESTATE.—The chairman of the Electricity Committee has reported that the Works Sub-Committee has interviewed the applicants and principal owners with respect to a supply of electricity to their buildings on the White Lund Estate, and the borough electrical engineer has submitted details of the proposed scheme showing an estimated expenditure of £950. The scheme has been approved, and application is being made for consent to supply electricity within the rural district of Heaton and Oxcliffe.

Morocco.—ELECTRICAL DEVELOPMENT.—A message from Rabat states that work on the electrical system in Morocco is making good progress. The first programme includes the construction of a system of 650 km. of lines (406 miles) for the transmission of power at 60,000 V. At present 230 km. has been constructed—from Casablanca to Rabat and Kouriga, the centre of the phosphate mining district. These lines will provide electric traction for the normal-gauge line. The section Rabat-Kenitra (40 km.) is under construction, and when it is completed the transmission of power from Casablanca to Marrakech and Mazagan will be taken in hand. The thermo-electric power station of 18,000 kW at Casablanca, which supplies this power, has cost 24,000,000 fr. It is hoped that next year the Sidi-Mâcheu station will be put into service. The cost of this station will be 60,000,000 fr.—*Reuter's Trade Service* (Paris).

Newcastle-on-Tyne. — CHANGE-OVER. — The Corporation Transport and Electricity Committee has assented to the proposal of the Newcastle-upon-Tyne Electric Supply Co., Ltd., to change over from d.c. to a.c. in the east central area.

Pontefract. — ELECTRICITY CHARGES. — The *Manchester Guardian* reports that the Pontefract Chamber of Commerce, in conjunction with the Town Council, has formulated a statutory notice of application to the Ministry of Transport for a compulsory reduction in the price of electricity supplied in the borough by the Yorkshire (West Riding) Electric Tramways Co., Ltd. The present price is 7d. per kWh to ordinary consumers for lighting. The appeal is based principally on the ground that the suppliers are now purchasing in bulk from the Yorkshire Electric Power Co. at a very greatly reduced cost compared with the former cost of independent production.

Prestwich.—ELECTRICITY SUPPLY.—The Urban District Council has prepared schemes for lighting housing estates by electricity at a cost of £2,124 and converting the lighting in certain streets from gas to electricity at a cost of £2,863.

Radcliffe.—LOAN.—The Urban District Council has applied for sanction to a loan of £21,927 for electricity purposes.

Sheffield.—PROPOSED PRICE REDUCTIONS.—The *Manchester Guardian* reports that the Electric Supply Committee of the City Council has decided to recommend that the price of electricity in Sheffield be reduced to pre-war levels.

Southend-on-Sea.—ELECTRICITY IN BULK.—The Town Council has accepted the offer of the County of London Electric Supply Co., Ltd., for a bulk supply of electricity delivered into the generating station at Leigh at a standing charge of £5 10s. per annum per kW of maximum demand, measured over half-an-hour with a running charge of 0.3d. per kWh. The necessary plant for receiving the bulk supply is to be obtained at an estimated cost of £1,200. A loan of £12,000 for services has been applied for.

Stirling.—YEAR'S WORKING.—The accounts of the burgh electricity undertaking (engineer: Mr. W. R. Murray) for the year ended May 15th last show a total revenue of £16,491, and working expenditure of £9,938, leaving a gross profit of £6,553. The figures for the preceding year were: Income, £17,051; working expenses, £12,820; gross profit, £4,231. After deducting capital charges there was a net surplus of £1,665, as against a deficit of £604 in 1926-27. The sales of electrical energy increased from 1,196,579 to 1,340,540 kWh, and the maximum supply demanded from 803 to 830 kW.

Tramway and Railway Notes.

Birkenhead.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking for the year ended March 31st last show a net profit of £7,360, and there was a surplus from the motor-omnibus system of £28,343, making a total of £35,703, from which £14,120 was contributed to the borough rate. The number of passengers carried by the tramway increased from 19,092,982 to 19,607,155.

Continental.—Switzerland.—A report on the working of the Federal Railways during 1927 shows that the expenditure on constructional work amounted to 86.4 million fr., as compared with 104.8 million fr. in 1926. Electrification work necessitated an outlay of 60.3 million fr., or about 12.7 million fr. less than in 1926. With the fourth instalment of the Federal subsidy the actual expenditure for electrification in 1927 totalled 50.3 million fr. At the end of the year the Federal Railways operated 1,435 km. of electrified lines, six new sections, totalling 435 km., having been opened to electric traction in the course of the year. At the beginning of the current year the Federal Railways had in service 323 main-line electric locomotives, 39 motor coaches, 17 accumulator locomotives, and four electric shunting locomotives. Twelve heavy electric locomotives, 10 shunting locomotives, and eight motor coaches were ordered in 1927 at a total cost of 14 million fr. From May 15th, 1927, onwards, 30 electric locomotives equipped for one-man driving were in regular service for slow trains and goods trains on lines where the maximum gradient does not exceed 1 in 66 (16 per thousand). This system of driving is proving very satisfactory. The total production of the power stations owned by the Federal Railways amounted to 414,917,000 kWh, of which 299,132,000 kWh was utilised for traction and 115,785,000 kWh was sold to industrial consumers. Another 18,406,000 kWh was obtained by the railways from private power stations and utilised for traction purposes. The Vernayaz hydro-electric station was put into service in April, 1927. The installed plant is rated at 99,000 h.p., and this station is the largest owned by the railways.

Doncaster.—Railless Cars.—The first section of the scheme for effecting the conversion of the Corporation tramway to the railless-car system was completed on August 23rd, when the tramcars were withdrawn from the Bentley route and a railless-car service was introduced. The new cars are of the double-deck type, with six pneumatic-tired wheels, and will carry 60 passengers. They are all fitted with air brakes. The next route to be converted will be that to the racecourse.

Erith.—Year's Working.—The accounts of the Urban District Council's tramway undertaking (manager: Mr. J. C. Williams) for the year ended March 31st last show a total income of £26,155, and working expenses of £27,370, leaving a gross deficit of £1,215. After payment of capital charges there was a net loss of £4,664.

United States.—New York.—The New York correspondent of *The Times* reports that an accident occurred on August 24th in the subway near Times Square Station. The accident was caused by the derailing of the rear car of a train which was packed with "rush-hour" passengers. The electricity supply was cut off, bringing the whole of the west side underground system to a standstill. It is estimated that 100 passengers were injured, the majority of them seriously, and the number of deaths is placed at 25.

Later reports state that the train of ten cars had just cleared the station platform and was gaining speed as it passed over a switch. The first eight cars passed the switch safely, but the last two suddenly left the track. A preliminary investigation by the subway company attributes the accident to the error of an employé in not giving warning of the faultiness of the switch, the working of which, it has been discovered, was unsatisfactory. An official inquiry into the disaster has been ordered.

Telegraph and Telephone Notes.

Australia.—Radio-Telephony.—Mr. H. P. Brown, Director of Posts and Telegraphs, who is returning from a tour in Europe and America, stated in an interview on August 22nd that he was anxious to introduce regular radio-telephony between Great Britain and Australia. The business communities were, he said, reaching out for the new facility, but an early difficulty would be the synchronisation of the times, as only two or three business hours out of the 24 coincided. Mr. Brown added that all the new developments of radio-telephony and television would be introduced into Australia within a reasonable time.—*Reuter* (Fremantle).

Canberra.—Mr. Bruce has announced that the Government does not intend constructing a high-power wireless station at Canberra, advocated by high military officers as a war precautionary measure. Mr. Bruce said if a war seemed likely next year there might be some justification for such a station, but under the present conditions there was none.

Continental Telephony.—Service to Austria.—The *Daily Telegraph* reports that a "through" telephone circuit has now been provided between London and Vienna and a reduction has been made in the charges for service between this country and Austria. The new charges for a call of three minutes' duration to any part of Austria vary from 14s. to 17s. 6d. during the day, and from 8s. 6d. to 10s. 6d. during the night, according to the part of this country from which the call is made.

The telephone service between Germany, Belgium, and Switzerland and Portugal was recently inaugurated.

India.—Regenerator System.—The success achieved by the Eastern Telegraph Company with the installation of the regenerator system of working with South Africa has prompted the company to extend the system to its cables to India. In order to make this possible the company has laid new cables between Alexandria and Port Said and multicore underground cables between Port Said and Suez. London is now in direct touch with India without any retransmission of messages being required at intermediate points, thereby considerably accelerating the circulation of telegraphic correspondence. —*Reuter.*

Italy.—Telephones in the Vatican.—The Rome correspondent of the *Daily Mail* reports that the Vatican has inaugurated a new automatic telephone installation connected with the city's automatic system. The plant was supplied by a German firm, and consists of 100 instruments.

New Zealand.—Wellington-Auckland Telephone Improvement.—*Tenders* reports that the New Zealand Government has decided to procure from Great Britain carrier telephone equipment for installation on the line between Wellington and Auckland as a first instalment in the improvement of the long-distance services.

Spain.—Malaga.—An automatic telephone exchange has recently been completed and put in operation in the town of Malaga.

Turkey.—Telephone Service.—It is reported from Angora that the Swedish Ericsson Co. has made proposals to the Turkish Government for the purpose of securing a contract for the construction of telephone lines between the principal Turkish cities. It is stated that the proposed contract provides for the construction of a line between Angora and Constantinople within ten months after signature and the construction of the other lines named in the contract within five years.

United States.—Wireless Service to Liberia.—The Radio Corporation has been authorised by the Washington Government to establish a direct wireless service to Liberia.

Telephone Service.—There were 18,365,486 telephones in use in the United States at the beginning of 1928, compared with 17,574,252 on January 1st, 1927, a gain of 791,234 during the year, comparing with 16,720,224 at the beginning of 1926, the gain during that year having been 854,028 telephones.

Telegraph Agreement.—The use of the wires and other facilities of the American Telephone and Telegraph Company, which is now enjoyed by the Western Union Telegraph Company, has now been extended also to the Postal Telegraph Company by virtue of contracts, the signature of which was officially announced on August 23rd. A great increase in competition between the two rival companies is expected as a result of the new arrangement.—*Reuter* (New York).

Radio Notes.

Australia.—Tasmania.—According to the *Electrical Engineer of Australia and New Zealand*, the Tasmanian broadcasting station, 7ZL, Hobart, has been acquired by the Dominion Broadcasting Co. Pty., Ltd., proprietors of 3LO and 3AR, Melbourne.

Ballarat. — The Postmaster-General's department has asked the Dominion Broadcasting Co., Melbourne, to arrange for the establishment of a relay broadcasting station at Ballarat. A telephone circuit is now available for transmission of the programmes.

Regional Broadcasting.—The *Wireless Trader* reports that a site has been provisionally selected for the erection of a B.B.C. high-power regional broadcasting station near Glasgow. If, as is anticipated, the plans are passed by the Postmaster-General this week, work will commence on the new station almost immediately. A start has already been made at the site of the London station at Potters Bar.

Switzerland.—League of Nations and Wireless.—A *Reuter* message from Geneva states that the Secretariat of the League has communicated to the States members of the League the supplementary report relating to the establishment of a League wireless station to be used by the Secretariat in times of crisis, which will be considered at the forthcoming meeting of the Assembly. The Federal Political Department, in a covering note, considers it indispensable that the Federal Government should possess the power in times of crisis to delegate an observer at Geneva whose duty it should be to inform the Federal Government regarding the activity of the station.

The report of the Secretary General contains an offer from the Swiss Government, the principal points of which are as follows: The wireless telegraph station to conform to the technical conditions indicated by the experts of the League, and to be constructed in the neighbourhood of Geneva by the Swiss Wireless Company. In normal times it is proposed that it should be administered by this Company, which would afford to the League of Nations all the customary facilities and necessary priorities. In times of crisis the station would be handed over to the League of Nations, which would utilise it freely and on its own responsibility. In both events the needs of private and commercial traffic would be taken into consideration. The financial arrangements would provide for an equitable division of charges and receipts as between the Swiss Administration and the League of Nations. In general the report follows the lines of the recommendations made by the Committee of Experts on Telegraphic Developments.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—October 5th. Department of Navigation and Ports. One 20-ton electric transporter. (A.X. 6694.)*

Australia.—MELBOURNE.—Posts and Telegraphs Department. November 6th. Automatic telephone switching equipment. (B.X. 4638.)*

October 16th. Telephone register coils and mounting plates. (B.X. 4639.)*

October 23rd. Posts and Telegraphs Department. Insulated wire. (B.X. 4674.)*

October 22nd. State Electricity Commission of Victoria. Transformer and spares for the Yallourn power station and the Richmond terminal station. (B.X. 4637.)*

December 17th. Supply of metal-clad switchgear and accessories. (Spec. 28/68, £1 1s. for three copies.)

August 29th. Victorian Railways. Private automatic telephone exchange and accessories. (B.X. 4652.)*

SYDNEY.—October 10th. N.S.W. Railways and Tramways. 2,200-V ironclad switchgear for Sefton sub-station. (Spec. 2s. 6d., from the Chief Electrical Engineer.) November 14th. Supply and erection of ash-sluicing equipment for Lithgow power station. (Spec. 819, 5s., from the Chief Electrical Engineer.)

Belgium.—ANTWERP.—September 6th. Port Authority. 35 steel masts for electric lighting. (A.X. 6704.)*

September 27th. Supply and erection of 32 electrically-operated portal travelling cranes. (A.X. 6712.)*

BRUSSELS.—September 27th. Municipal Council. Supply and installation of a transformer plant at the central power station. Particulars from Hôtel de Ville.

Bradford.—Electric lighting installation, eight combined shops and houses, Swain House estate, and eight combined shops and houses, Lower Grange estate. Tenders to Mr. N. L. Fleming, town clerk, Town Hall.

Brentwood.—September 8th. Essex and Colchester Mental Hospital Committee. Electric cables, conduits and control gear for the Brentwood Mental Hospital. (August 17th.)

Bridport (Dorset).—September 29th. Town Council. Power-house equipment, Section 2, including three generating units totalling about 600 kW. (See this issue.)

Croydon.—September 6th. Board of Guardians. Electrical fittings and appliances for six months. Norman P. Walker, clerk, Mayday Road, Thornton Heath.

Dundee.—September 14th. Electricity Department. E.h.p. and l.p., paper-insulated, lead-covered and double-steel-tape armoured cable for working pressures of 6,600 and 660 V respectively. 8 and 9 m/m arc lamp carbons suitable for burning in Angold magazine flame arc lamps. (See this issue.)

Edinburgh.—September 7th. Corporation. Structural steel work for coal bunkers in the electric generating station extension, West Bank, Portobello. Schedule from city architect.

Egypt.—CAIRO.—October 20th. Ministry of the Interior. D.c. generator set for the Beni Mazar power station. (B.X. 4660.)*

India.—September 6th. Assam-Bengal Railway Co., Ltd. Overhead electric cranes. Specification 21s., from the offices of the company, Bishopsgate House, E.C.

Leeds.—September 29th. Electricity Department. Supply and erection of 3-phase switchgear at Kirkstall power station. (See this issue.)

London.—STOKE NEWINGTON.—Electricity Department. Twelve months' supply of paper-insulated, lead-sheathed and armoured cables; 12 months' supply of d.c. house service meters. (August 17th.)

H.M. OFFICE OF WORKS.—September 4th. Supply of electrical and mechanical engineering labour in daywork in Cardiff. (August 17th.)

September 10th. Steel conduits and fittings for electric wiring.

September 18th. Renewal of battery plates at the National Physical Laboratory, Teddington. (See this issue.)

Manchester.—Hospital Sub-Committee. Supply and erection of three twin v.i.r. taped lead-covered, steel-tape armoured, and jute served, 600-megohm grade cables. (August 24th.)

New Zealand.—WELLINGTON.—November 27th. Public Works Department. Generators and water turbines, in connection with Section 1 of the Waitaki power scheme. (B.X. 4677.)*

Oldham.—September 10th. Board of Guardians. Electric lamps and fittings for the Institution, Rochdale Road. Form of tender, &c., from Mr. F. W. Fletcher, clerk to Guardians, Union Offices.

Paulton.—September 17th. Board of Guardians. Electric lighting installation at the Isolation Hospital; Mr. A. J. Pictor, architect, 14, Queen Square, Bath.

Pentre, Rhondda.—September 4th. Rhondda Urban District Council. Electricity Department. One 150-kVA 3,500/414-V, 3-phase static transformer and one 150-kVA, 11,000/414-V ditto. (August 17th.)

South Africa.—JOHANNESBURG.—Railways and Harbours Board. September 20th. One electrically-driven heavy-duty double-face-plate wheel lathe for Germiston repair shops. (A.X. 6660.)*

September 27th. Arc welding sets. (B.X. 4647.)*

PRETORIA.—October 4th. Department of Posts and Telegraphs. Copper wire and lead covered cable. (B.X. 4657.)*

South-East England.—October 5th. Central Electricity Board. Supply, delivery, and erection of 132,000-V outdoor switchgear for the transforming stations in the area covered by the South-East England Electricity Scheme, 1927. (August 24th.)

Stoke-on-Trent.—Electricity Department. One 1,200-amp. secondary storage battery. (August 17th.)

Torquay.—September 4th. Corporation. Electric decorative strip lighting in the Town Hall ballroom. Specifications can be seen upon application at the offices of the Town Clerk.

Uruguay.—MONTEVIDEO.—September 28th. R.I. wires and cables for indoor installations. (B.X. 4651.)*

October 5th. Electrical material. (B.X. 4666.)*

Walsall and West Bromwich.—September 28th. Unions Joint Committee. Supplies, including electrical fittings. Form of tender, &c., from Mr. A. H. Ward, clerk, 22, Lombard Street, West Bromwich.

Waterford.—September 14th. Corporation. Single-phase and three-phase alternating-current house service and other meters. (See this issue.)

September 21st. Materials for and erection of consumers' overhead services. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—Commonwealth Postmaster-General's Department. Accepted:—

Underground and aerial cable (£38,138); jumper rings and terminal strips (£262); h.d. copper and cadmium copper wire (£38,465); magnet and resistance wire (£411).—British Insulated Cables, Ltd.

Insulated wire (£364).—Gilbert Lodge & Co., Ltd.
Telegraph instruments (£2,121).—Siemens (Aust.) Pty., Ltd.
Telephones and dials.—Siemens (Aust.) Pty., Ltd. (£550); British General Electric Co., Ltd. (£3,118); Phœnix Telephone & Electric Works, Ltd. (£259); Automatic Telephones, Ltd. (£19,962).
Cordless switchboards.—Ericsson Telephone Mfg. Co. (£1,759); Siemens (Aust.) Pty., Ltd. (£4,249); Sterling Telephone and Electric Co., Ltd. (£338).
Transmitters and associated parts.—Phœnix Telephone and Electric Works, Ltd. (£242); Siemens (Aust.) Pty., Ltd. (£642); Ericsson Telephone Mfg. Co. (£292).
Dry cells (£438).—Ever-Ready Co. (Gt. Britain), Ltd.; and S. Hoffnung & Co., Ltd.
Protective apparatus.—Siemens (Aust.) Pty., Ltd. (£2,353); Stromberg-Carlson (Aust.) Pty., Ltd. (£796).

Melbourne.—City Council. Accepted:—
Electricity meters.—Landis & Gyr, Ltd. (£1,643); Warburton Franki, Ltd. (£311); W. Begg & Sons (£1,465); Australian General Electric Co., Ltd. (£42).
Glass battery jars.—Crown Crystal Glass Co., Ltd.
Victorian Electricity Commission. Accepted:—
6,600-V trailing cable (£305).—British Insulated Cables, Ltd.

Sydney.—City Council. Accepted:—
Service boards (£1,266).—D. Hardy & Sons, Ltd.
Ornamental street lighting units.—Australian Westinghouse Electric Co., Ltd. (£1,120); Robert Bryce & Co. Pty., Ltd. (£488).
A.c. meters (£4,475).—Electricity Meter Mfg. Co., Ltd.
N.S.W. Railways. Supply of transformers:—
Five 7.5-kVA., five 30-kVA, and five 50-kVA (£908).—Australian General Electric Co., Ltd.
Five 75-kVA (£468), and one 900-kVA (£1,176).—Johnson and Phillips, Ltd.
Five 15-kVA (£184).—Siemens (Aust.) Pty., Ltd.

Western Australia Government Tender Board. Accepted:—
Portable electric welding plant (£433).—Elder, Smith and Co., Ltd.
Transformer, 150 kVA, 20,000/2,200-V, three-phase (£209).—British Electric Transformer Co., Ltd. —*Tenders.*

Egypt.—Mansura.—The following tenders were received by the State Telephone Administration for the supply and erection of a new telephone exchange at Mansura in Lower Egypt:—

	Automatic Exchange. £E.	Manual Exchange. C.B.I. £E.
Automatic Telephone Mfg. Co. ...	12,632	—
Siemens & Halske, A. G.	13,051	
	14,752 alternatives	13,507
Siemens Bros. & Co., Ltd., London	15,461	13,686
L. M. Ericsson & Co., Stockholm	16,554	
	17,061 alternatives	11,312
Ericsson Telephones, Ltd., London	21,102	13,774

A *Reuter's Trade Service* message from Cairo says that interest in these particular tenders has been increased by the fact that tenders for a more important contract for the supply and erection of a full automatic telephone equipment at Cairo and associated subscribers' apparatus are to be opened on September 1st.

Glasgow.—Housing Committee. Recommended:—
Electric lighting installation at 852 houses at Knightswood (£3,884).—Darroch & Espie.
Electricity Committee. Accepted:—
Time switches.—Horstmann Gear Co., Ltd. (100); Venner Time Switches, Ltd. (54).
Cookers (50).—Falkirk Iron Co., Ltd.
Electric kettles (500).—Bulpitt & Sons, Ltd.
Electric fires.—Belling & Co., Ltd. (2,750); William C. Yuille Co. (250).
Watch and Lighting Committee. Recommended:—
Overhead cable (£271).—Mersey Cable Works, Ltd.
Tramways Committee. Accepted:—
Boiler drum for Pinkston.—Babcock & Wilcox, Ltd.
D.c.c. wire.—British Insulated Cables, Ltd.; and General Electric Co., Ltd.

India.—Bombay.—Standing Corporation Committee. Accepted:—
Supporting, safeguarding and repairing cables belonging to the Andhra Valley Power Supply Co., Ltd., during construction of Corporation water works (Rs. 1,613).—Callender's Cable & Construction Co., Ltd.

Irish Free State.—Waterford.—Corporation. Accepted:—
Switches for public lighting (£3,725).—English Electric Co., Ltd.

Manchester.—Electricity Committee. Accepted:—
Tapes.—W. T. Henley's Telegraph Works Co., Ltd.; Callender's Cable & Construction Co., Ltd.; Johnson and Phillips, Ltd.; J. Bonas & Son; Siemens Bros. and Co., Ltd.; Mitcham Waterproofing Co., Ltd.
Wires (cotton and silk covered).—London Electric Wire Co. & Smiths, Ltd.
Wire (tinned steel binding).—Bruntons.

Newcastle.—Markets Committee. Accepted:—
Electrification of 65-ton crane on the quayside (£497).—Clarke, Chapman & Co., Ltd.

New Zealand.—Public Works Department.
Generator and turbine (£14,528).—Cory-Wright & Salmon.
Motors and switchgear for Westfield abattoirs (£705).—Crompton-Parkinson, Ltd. —*Tenders.*

South Africa.—Cape Town.—Electricity Committee. Recommended:—
Adaptation of premises at corner of Plein Street and Victoria Road, Woodstock, as electricity showrooms (£2,013).—J. Loftus.
Hard-drawn copper wire (£4,308).—British Insulated Cables, Ltd., and Dowson, Dobson & Behr.
5,000 round-top insulators (£112).—British Insulated Cables (S.A.), Ltd.
5,000 large shackle insulators (£113).—Hubert Davies and Co.
10,000 60-watt, 230-V Siemens "Wotan Centra" lamps, with reinforced spiral filament, 2,000 60-watt b.c. lamps, and 1,000 300-watt G.E.S.—C. E. Scott.
3 tons fine solder (£128 16s. a ton) and ½ ton of plumber's metal (£96 3s. a ton).—Davis & Soper, Ltd.

Southend-on-Sea.—Town Council. Accepted:—
Leigh sub-station: 1,000-kW rotary convertor (£3,060); automatic switchgear (£3,225). Thorpe Bay sub-station: 750-kW rotary convertor (£2,419); automatic switchgear (£3,145).—General Electric Co., Ltd.

Wakefield.—Education Committee. Accepted:—
Switchboard for technical college extensions.—Crompton-Parkinson, Ltd.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

Holiphone prismatic lighting.
Daylight signs suitable for steam lorries.
An ice-cream machine with a capacity of half a gallon.

Notes.

Electrical Prospecting.

It is announced from New York that a contract has been signed between the Swedish-American Prospecting Corporation and the Gulf Oil Corporation of Texas for the continuation of electrical prospecting for deposits of oil. The contract is for two years and can be prolonged for a further three years. Twelve Swedes are working in Texas at present under the lead of Mr. Karl Sundberg, while Mr. Hans Lundberg, together with ten other Swedes, is occupied in Newfoundland, and others in North Michigan. In connection with the Boston meeting towards the end of August of the American Institute of Mining Engineers, a display has been arranged of Swedish geophysical instruments, and a report will be presented on the electrical investigations carried out in Questa, New Mexico, where important deposits of molybdenum are reported to have been discovered. After the meeting an excursion has been arranged to different places in Newfoundland, including Buchans Nile, where Swedish engineers have come across large deposits of lead.

A Summer School.

With the object of bringing together for their mutual benefit those responsible for the technical training of the young engineer and those responsible for his practical training and future employment, the Metropolitan-Vickers Electrical Co., Ltd., has established a Summer School to be held at the Trafford Park works on September 10th to 14th next. Members from all the leading technical colleges and universities will meet the "industrial" members of the school. The proceedings will include lectures, discussions, and works visits, as well as social events.

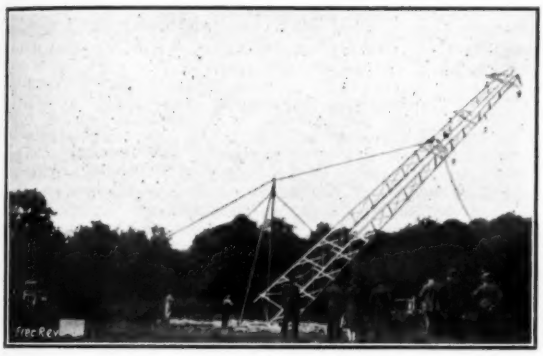
New Electric Vehicles.

A fleet of six distinctive electric vans has recently been put into operation by an American concern, the Bonsoit Teller Co., of New York. The vehicles are intended for delivery work, and have been designed to resemble outwardly a petrol-driven vehicle. It is stated that the vans will run about 70 miles on a single battery charge, and that they are capable of travelling at 18 miles per hour. It is also interesting to note that the vehicles are equipped with wire wheels and large-size pneumatic tires.

Overhead Transmission Lines.

A new method of erecting masts for overhead transmission lines, which makes for greatly increased efficiency, was recently demonstrated to a party of people prominent in the electricity supply industry by the Shropshire, Worcestershire, and Staffordshire Electric Power Co., at Alveley, near Kidderminster, a point on the company's new line from the Stourport power station to Bridgnorth, Shropshire.

The masts are of the steel lattice pattern, each measuring 60 feet and weighing approximately three tons. The old method was to erect them in sections, a necessarily tedious process. In the method demonstrated, the whole of the completely equipped mast was raised from horizontal to vertical, and finally bolted down into position, within the space of one



Erecting a 3-ton Mast in 90 Seconds.

minute and a half, a performance which greatly impressed the visitors. The method involves the use of shear legs and a six-wheeled commercial vehicle only. It is to be used henceforward wherever possible in the erection of the company's new lines, and will considerably facilitate the work.

Those present included Mr. R. A. Chattock, Birmingham City electrical engineer, Captain Donaldson, chief engineer of the North Metropolitan Electric Power Supply Co., Mr. C. D. Taite, chief engineer and manager of the Lancashire Electric Power Co., Mr. C. Douglas Coe, Hereford City electrical engineer, Mr. E. Garcke and Mr. W. G. Bond, chairman and managing director of the S.W.S. Co., respectively, and Mr. J. T. H. Legge, the company's chief engineer and manager.

The Flexibility of Plain Pipes.

Circular No. 1440/9-1 issued recently by the Metropolitan-Vickers Electrical Co., Ltd. (price 2s. 6d. net), is a reprint of an article "The Flexibility of Plain Pipes," by Mr. J. R. Finniecome, M.Eng., which appeared in a recent issue of the *Metropolitan-Vickers Gazette*. It contains a series of mathematical formulæ for various bends of plain pipes, a graphical method for determining the flexibility of any pipe bend, a comparison of theoretical values with actual test figures, and an analysis of tests on the basis of the Karman theory. The author has proved the great value of the Karman theory, which takes into consideration the flattening effect of the original cross section of the pipe. He shows that the maximum Karman combined bending stress is considerably greater than the maximum theoretical longitudinal bending stress calculated by the simple bending theory, and recommends that the former should be used for the design of pipes. He finds that the actual deflection stresses and thrust agree very closely with the Karman theory, and that the simple bending theory should only be used as a means of calculating values which will have to be corrected by factors. The value of this publication to engineers and manufacturers lies in the fact that by inserting into the general formulæ certain factors given in a series of tables and graphs, the actual deflection, stress, and thrust of any pipe bend can very easily be obtained without laborious calculation.

The New International Association for Testing Materials.

An International Association for Testing Materials of Construction was in active existence before 1914, and held a series of congresses, the last in New York in 1912. The existence of this earlier Association was brought to an end by the war, and for many reasons British opinion was averse to the revival of the old Association; but at a congress held in Amsterdam in 1927, the New International Association for Testing Materials was formed. The activities of the British representatives resulted in the adoption of a new and much more satisfactory organisation for the New Association; in particular, the whole question of international standard specifications has been entirely eliminated from the activities of the Association.

It has not been thought desirable to form a British Society for Testing Materials, but in order to secure adequate British representation in the New Association, and to secure satisfactory British support for an international movement of such importance, a British Committee has been formed, consisting of representatives appointed by a number of the most important British institutions and societies.

The British Committee, of which Sir Henry Fowler, K.B.E., is chairman, has appointed Dr. W. Rosenhain, F.R.S., to act as British representative on the Permanent Committee of the New International Association, of which body he has since been elected a vice-president. The Permanent Committee has established four International Committees to deal respectively with the four sections into which the work is to be divided, and has appointed the following chairmen:—

Dr. W. Rosenhain, F.R.S. (Great Britain), Section A—Metals.

Professor Ros (Zurich), Section B—Inorganic non-metallic materials (cement, concrete, &c.).

Mr. Roos af Hjelmsäter (Sweden), Section C—Organic materials (oil, india-rubber, &c.).

Mr. von Moellendorf (Germany), Section D—Methods of testing.

The British Committee is anxious that our status and prestige in the International Association should be fully maintained, and has issued an appeal to the members of the constituent societies and institutions to become members of the N.I.A.T.M. The subscription is 10s. per annum for individual members, and not less than 20s. per annum for societies, firms, and undertakings in their corporate capacity. No entrance fees or formalities are required. Members will receive a periodical bulletin keeping them informed of the activities of the Association. Congresses are to be held every three or four years, the next being at Zurich in 1931.

Membership applications and remittances should be sent to Mr. G. C. Lloyd, hon. secretary and treasurer, 28, Victoria Street, London, S.W.1, from whom further particulars can be obtained.

Appointments Vacant.

Assistant lecturer and demonstrator in electrical engineering at the University of Sheffield. Mains assistant for Hazel Grove and Bramhall Urban District Council. (See our advertisement pages to-day.)

Electrical Heating in Schools.

The request of the Education Authority of Glasgow for permission to continue the experimental heating of schools by electricity has been granted by the Corporation Electricity Department.

Fatalities.

Percy Vincent Stocker, of Victoria Road, Kentish Town, N.W., a railway kitchen porter, received a fatal electric shock in the kitchen of a dining car attached to a train in Leeds Central Station on August 23rd. Stocker was attending to the electric cooker when he came into contact with live metal. He was flung from the kitchen into the corridor and when picked up was unconscious. First aid was administered, and he was taken to the infirmary, but on arrival was found to be dead. The recharging of the train with electricity for cooking and lighting is done at a special track from standards; the recharging was in progress when Stocker was found in the corridor. This is the first accident of the kind on the L. and N.E. Railway. The electric standards have been in use at King's Cross, at Leeds, and Edinburgh for about two years.

The Times reports that at the inquest, which was held on August 25th at Leeds, Herbert William Hogg, the electrician in charge of the train, stated that he could find nothing wrong with the electrical installation. Edward Busfield, electrician of Leeds Fire Brigade, who had examined the coach on behalf of the police, said that under a fish boiler the earth pin was badly burned owing to a short circuit at some time. At the bottom of the kitchen, by the boiling plates, he found a loose wire badly burned and the end about 3 inches short of its original connection. There was bare copper wire on the left-hand side of the boiler. Two boiler plates were fitted in a recess, but the earth contacts were faulty owing to grease. Hogg (recalled) said that he knew of bare wires and of exposed places on the wires, which were part of the original installation made about five years ago, but they had been frequently changed and renewed. George Wilson, foreman electrician for the Great Northern section of dining-car trains, said the circumstances were rather exceptional. Stocker was not standing on the wood grating used when cooking was going on, as he had evidently lifted it to wash underneath. His hands and apron were wet, and there was a metal buckle on his belt. A verdict of "Accidental death from electric shock" was returned. A Ministry of Transport inquiry is to be held.

An inquest was held at Chorley on August 24th on the body of James Briggs (35), a fireman and engine tender, who was discovered unconscious grasping an inspection lamp which he had made. Mr. W. Brown, H.M. inspector of factories, stated that the lamp had a metal handle, and if a fault occurred the user was liable to receive a shock at 230 V. A lamp of that type was prohibited by the electricity regulations.

A New Telephone Exchange.

With the opening on August 25th of a new telephone exchange at Wilpshire, another link has been forged in the chain of Strowger automatic telephone exchanges inaugurated by the British Post Office. A parish some three miles to the north of Blackburn, with a population of something like 2,000, Wilpshire subscribers are now accorded the same privileges and enjoy the same improved service that their near neighbours in Blackburn have experienced since 1916.

The initial capacity of the new exchange at Wilpshire, which will work in conjunction with the 3,400-line Strowger exchange at Blackburn, is 275 subscribers and 25 coin box lines, and the ultimate capacity, 400 lines. Three line-switch units comprise the major portion of the equipment, and upon them is mounted the whole of the apparatus, with the exception of the repeaters, which are accommodated on a separate rack, and the meters, which are carried by a 1-bay meter rack. Only the incoming 3rd and final selectors are located in the Wilpshire exchange, the 1st and 2nd group selectors and the outgoing auto-to-auto repeaters and test-offering relay group being accommodated in the main exchange at Blackburn. The system is 5-digit, with 4th-wire reverse battery metering. The "cut-over" of Wilpshire to automatic operation took place without a hitch, and its working is as effective as that of the original Blackburn network of which it now forms part. The equipment was provided by the Automatic Telephone Manufacturing Co., Ltd.

A Diesel-Electric Ferry Boat.

Messrs. Yarrow & Co., Ltd., launched on August 20th, the Diesel-electric ferry-boat *M.O.P.5B.A.* for the Argentine Government. The boat is 145 ft. in length, 36 ft. in breadth, and of 4 ft. 5 in. draught, and has four propellers—two forward and two aft. The main propelling machinery consists of four M.A.N. internal combustion engines, supplied by the Maschinenfabrik Augsburg-Nurnberg A.G. The Metropolitan-Vickers Electrical Co., Ltd., supplied the electrical transmitting gear. The engines will develop an aggregate of 580 h.p., and will give the vessel a speed of over nine knots. The ferry-boat is intended for service on the River Parana and its tributaries, and is designed for carrying automobiles and passengers.

Another Diesel-electric vessel—a cargo carrier of 9,200 tons, built at Greenock—was to run its trials on August 29th. It has one set of Diesel engines made in Germany and electrical gear made in Rugby.

The Shannon Scheme.

Mr. J. C. Foley, a director of the Electricity Supply Board, speaking at the Limerick Rotary Club last week, referred to the Shannon scheme, and said that when completed it would be the largest power plant in these islands. Under the partial development the station would generate 90 000 h.p., which could be increased by the "further" and "final development" of the scheme. By its aid they would have more efficient and cleaner houses, better lighting and cooking, better means of transport, less hard labour, and greater application of science. His colleague on the Board, Dr. McLaughlin, had found during his recent trip to the United States that the Shannon scheme was the one thing that interested everybody over there; it was to them a striking illustration that the Irish Free State was no longer content to be a poor, backward country, and that the new régime meant business. He believed that in the future tourist traffic to the Shannon would be of a permanent nature; it was estimated that up to 20,000 people had taken advantage of the Board's general invitation to see the works, and of late they had had many distinguished visitors.

Electricity on the Poultry Farm.

With reference to the article under the above heading in our issue of August 17th, we are asked to state that the lighting load at the Buttercup Dairy Co.'s farm amounts to about 36 kW, which, with the power, makes a total loading for the farm of 260 kW.

U.S. Submarine Equipment.

The electrical equipment for U.S. Submarines V-5 and V-6, the largest fleet-class submarines ever built, has just been completed at the main works of the Westinghouse Electric and Manufacturing Company, East Pittsburgh. The boats will be of the twin-screw type, Diesel engines being used for propulsion on the surface, and d.c. motors, fed from lead storage batteries, for submerged operation. The design and construction of the motors represent a radical departure from conventional methods; the motors are designed in such a manner as to obtain the greatest possible amount of power from the minimum weight and volume of material. They are constructed almost entirely of steel, and parts of the bearing housings are made of aluminium alloy to reduce weight. As an additional means of conserving weight and space, forced ventilation is used. This permits a considerably greater output to be obtained from a given volume of material than with natural ventilation. A closed ventilating system is used, the air being cooled by passing through a special sea-water cooler. Mica and asbestos are used throughout for insulating purposes.

Standard System of Extra-high-pressure Supply.

In the *London Gazette* of August 17th the Electricity Commissioners published an Order dated August 10th, with regard to the supply of electricity at "extra high pressure," signifying general approval of the use of three-phase alternating current at pressures of 6,600, 11,000, 22,000, 33,000, 49,500, 66,000, and 132,000 volts, at 50 cycles per second. The Regulations are in the main identical with those issued on May 1st, 1925, and published in the Electrical Review of May 15th, 1925, p. 778, which are now superseded. The principal changes are the addition of 22,000 and 132,000 V to the list of approved pressures, and permission to use "hard burned tiles interlocked or suitably arranged so as to prevent displacement," as protection for lead-covered cables laid direct in the ground. These regulations relate only to underground mains; any other extra-high-pressure system than that described will require special approval.

Local Societies.

At a recent meeting of the Rotary Club of Edinburgh, Mr. Edwin Seddon, engineer and manager of the Edinburgh Corporation Electrical Department, gave an informative address on the "Portobello Power Station and the National Electricity Scheme." The speaker gave a technical description of the station, and touched upon the growth of the city's electricity supply.

Members of the Rotary Club of Hamilton recently visited the electricity works of the Clyde Valley Electric Supply Company at Stonebyres Falls, near Lanark, and also the Hamilton electricity supply station, over which they were conducted by Rotarian W. J. Cooper, the manager.

The Iron and Steel Institute.

The autumn meeting of the Iron and Steel Institute is to be held in Bilbao, Spain, on September 25th and 26th. The sessions will take place at the Assembly Hall of the Alfonso XIII High School, Bilbao, at 10 a.m. on the first day, and 3.30 p.m. on the second day. There will also be visits and excursions to the principal iron-ore mines and iron and steel manufacturing and engineering establishments in the neighbourhood, as well as to places of historic interest. An extended tour will also be made to Burgos, Madrid, Sagunto, Toledo, Cordova and Seville in the days immediately following the meeting.

Electricity Stations Underground.

Writing to *The Times* of August 22nd, Mr. G. W. Keats, borough electrical engineer, Woolwich, recalls that some 31 years ago he was engaged on plans in connection with the electricity station upon which the Rock of Gibraltar depended for its supply of light and power, placed in a position where gun-fire or hostile attack was unlikely to damage it. The City of London, he points out, is infinitely more important than the Rock; it is the nerve centre of our Constitution, and although the risks and possibilities of air attacks are known, apparently nothing is being done to ensure that its emergency lighting and power supplies are made immune from hostile attack. He suggests that, just as expenditure on super-Dreadnoughts and armaments is justified, so would expenditure on at least two underground generating stations be. It is of paramount importance that the supply of light and power should be absolutely protected in any emergency which may arise, and a couple of stations, kept in reserve if necessary, would go a long way towards ensuring that the essential services were maintained. The scheme would provide useful work for some of our unemployed colliers, and if another necessary public work could be put in hand—namely, that of providing underground shelters for the population—further work could be found. These shelters could be constructed in the form of tunnels or motor-ways, which would relieve traffic congestion in peace times and yet provide a haven of refuge, should ever such another emergency occur; and thus a two-fold purpose would be served. To the question: Where is the money to come from? he replies: From the source which provides our armaments.

Bituminous Coal Conference.

Some particulars are given in *Power* of the Second International Conference on Bituminous Coal, which is to be held under the auspices of the Carnegie Institute of Technology, Pittsburgh, Pa., on November 19th-24th next. About one hundred engineers and scientists representing fifteen nations have already tentatively accepted invitations to speak or to send papers to the Congress, and the number of speakers and delegates is growing daily. About 60 per cent. of the papers will be delivered by representatives of countries other than the United States. Although the Conference will be similar in purpose to the first Congress held in 1926, preliminary plans for this year's meeting show that its scope will be considerably enlarged and the programme will be more important and more international in character. The discussion of fixed nitrogen is one of the topics which will receive close attention. The liquefaction of coal, which was one of the principal subjects of discussion at the first meeting, will again occupy a prominent place in the deliberations. Low-temperature distillation will be treated by representatives of at least a half-dozen countries. High-temperature distillation, power from coal, coal tars and oils, complete gasification of coal, origin of coal, coal washing, pulverised coal, catalysts and the general

aspects of the bituminous coal industry are other topics that will be considered.

The economics of the coal industry will be discussed by Lord Melchett, England, Dr. Friedrich Bergius and Prof. Dr. Franz Fischer, Germany; Andre Kling and E. Audibert, France. Engineer Guardabassi, Italy, will deal with the subject of the liquefaction of coal. Low-temperature distillation will be treated by George E. K. Blythe, Dr. C. H. Lander, Harold Nielson and Dr. E. W. Smith, England; Dr. A. Herz, Joseph Plassman and Prof. F. P. Kerschbaum, Germany; Henri Lafond, Prof. Paul Lebeau, Antonie Vonk and A. Leante, France; Prof. Dr. Granigg, Austria; Prof. Yoskikiyo Oshima, Japan; Prof. Samuel W. Parr, Prof. Alfred H. White and F. C. Greene, United States.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The Crown Agents for the Colonies have appointed Mr. C. V. S. DICKINS, A.M.I.E.E., engineer, Outside Contracts Department, Messrs. Siemens Bros. & Co., Ltd., London, to the post of mains engineer, Electrical Department, Government of Ceylon, Colombo. Mr. Dickins will sail from Liverpool on September 7th by the s.s. *Oxfordshire*.

The applications for the position of general manager to the Leeds Corporation tramways have now been reduced to four, including three managers of municipal tramway undertakings, the fourth being technical expert to a large electrical manufacturing company.

Dr. W. R. WHITNEY, director of the research laboratory of the General Electric Co., of Schenectady, U.S.A., for the past twenty-eight years, has been elected a vice-president of the company.

From the last issue to hand of the *Journal* of the British Chamber of Commerce in Brazil, we learn that Mr. J. MAURICE has resigned from the management of the Cia. Radiotelegraphica Brasileira, and is leaving for England.

In order to co-ordinate the Australian interests of their 14 associated companies, Agricultural & General Engineers, Ltd., London, have appointed Mr. A. SIMPSON, formerly H.M. Trade Commissioner in Sydney, to act as their chief resident representative in Australia. Mr. Simpson's appointment will not interfere with any existing agency arrangements.

Sir HUGO HIRST, Bt., chairman of the General Electric Co., Ltd., was to leave England yesterday for Australia (accompanied by Lady Hirst). Sir Hugo, as our readers know, is one of the four members of the Government Mission appointed to confer with the Commonwealth Government and the leaders of industry and commerce on the development of Australian resources and other matters which might tend to the promotion of trade between the two countries. He will journey overland in company with Sir Arthur Duckham, K.C.B., the leader of the Mission, and Mr. Dougal Malcolm, another of the members of the Mission, and at Marseilles will join the *Mooltan*, in which the fourth member of the Mission, Sir Ernest Clark, K.C.B., sailed from Tilbury.

On Monday evening last Sir Hugo was entertained to dinner at the Café Royal by his fellow directors.

Obituary.—M. N. CAGIANUT.—The death is announced from Berne, Switzerland, at the early age of 46 years, of M. Nicolaus Cagianut, the director of the Bernische Kraftwerke Gesellschaft, and a leading Swiss expert on hydro-electric matters.

MR. J. L. SMITH.—We regret to learn of the death, which occurred on Sunday evening last, of Mr. J. L. Smith, power station superintendent at the Walthamstow Council's electricity works. After calling at the works on that evening, Mr. Smith suddenly collapsed in an adjoining street and died immediately. Prior to being appointed at Walthamstow in May, 1917, he was employed for a number of years as a charge engineer with the Stepney undertaking. Mr. Smith was highly respected by the staff and employés, and will be much missed.

Wills.—The late Mr. LEWIS HOAD, master of the Cableship *Telconia*, of the Telegraph Construction & Maintenance Co., left £8,676 gross and £6,768 net personalty.

Mr. J. A. CROWTHER, formerly Corporation electrical engineer at Wallasey, left £5,709 gross and £4,254 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Unbreakable Lamps, Ltd.—Private company. Registered August 18th. Capital, £100 in £1 shares. Objects: To acquire the business of factors of electrical accessories, signs, fittings, and lamps carried on by V. A. Walker at 67, Stafford Street, Birmingham, as the "Unbreakable Lamp Co." The directors are: V. A. Walker, 17, Woodstock Road, Moseley, Birmingham, electrical engineer; Mrs. E. D. Walker, 17, Woodstock Road, Moseley, Birmingham. V. A. Walker is managing director for five years at £156 per annum. Registered office: 67-8, Stafford Street, Birmingham.

Electric Art Shades (1928), Ltd.—Private company. Registered August 20th. Capital, £500 in £1 shares. Objects: To acquire the business of lampshade manufacturers and designers hitherto carried on by H. A. Chard and Laura G. Chard at Newland Street, Witham, Essex, and to carry on the business of manufacturers and designers of shades and fittings, &c. The subscribers (each with one share) are: P. E. Leaver, "Lynwood," College Avenue, Rhos-on-Sea, N. Wales, gentleman; Beatrice M. D. Stancliffe, "Brook Side," Sandy Lane, Romiley, Cheshire. P. E. Leaver shall be permanent director and chairman so long as he holds £400 shares. Registered office: Freebourne's Garage, Newland Street, Witham, Essex.

Olympia Gramophone Co., Ltd.—Private company. Registered August 18th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wholesale and retail wireless and gramophone merchants, manufacturers of and dealers in wireless and electrical instruments, accessories, &c. The first directors are: J. Bickler, Roxholme, Harehills Avenue, Leeds, trimming merchant; Isobel Kennedy, 75, Blackman Lane, Leeds, clerk. Secretary: E. Baker. Registered office: 49, Barrack Road, Leeds.

Oldhill Manufacturing Co., Ltd.—Private company. Registered August 20th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, parts, fittings, cabinets, accessories, &c. The directors are: H. Einbinder, 98, Wargrave Avenue, Stamford Hill, N.16; C. Cohen, 4, Cranwich Road, Amhurst Park, N.16; Mrs. R. Cohen, 91, High Street, Walthamstow, E. Registered office: 6-7, The Mews, Oldhill Street, Clapton Common, N.16.

International Acoustic Films, Ltd.—Public company. Registered August 20th. Nominal capital, £150,000 in 1s. shares. Objects: To acquire and hold interests in any company holding patents, rights, licences, concessions, and other interests in connection with acoustic or sound recording and producing processes, instruments and appliances, or in connection with films or film appliances, particularly in the Electrical Fonofilms Company Aktieselskab of Copenhagen, and in that company's allied and subsidiary companies. The first directors are: M. Ostrer, 19, Langham Street, W.1 (director of the Gaumont Co., Ltd.); R. C. Bromhead, 89, Hamilton Terrace, N.W.8, chartered accountant. Registered office: 25, Moorgate, E.C.

Electric Furnace Co., Ltd.—Public company. Registered August 23rd. Nominal capital: £200,000 in £1 shares (100,000 preferred ordinary and 100,000 ordinary). Objects: To acquire the business carried on by the Electric Furnace Co., Ltd. (in liquidation), together with the undertaking and all or any of

the assets and liabilities of that company, to adopt an agreement with the said company and its liquidator, and to carry on the business of contractors, builders, civil, electrical, constructional, metallurgical, mechanical, chemical, electrochemical, mining and general engineers, &c. The directors are: D. F. Campbell, St. Mary's House, Weybridge; and W. S. Gifford, Chesterton House, West Ewell, engineers (life directors). Registered office: 17, Victoria Street, Westminster, S.W.1.

Ato Clock Co., Ltd. — Private company. Registered August 20th. Capital, £500 in £1 shares. To carry on the business of manufacturers of and agents for clocks, electric and otherwise, &c. The first directors (to number not less than two nor more than five) are:—A. Guershoon, 66, Fairholme Road, Barons Court, W.14 (managing director Andrew and Co., Ltd.); L. Hatot, 23, Rue de la Michodiere, Paris, France (managing director S.A. des Etablissements Leon Hatot, Paris); J. H. Trumper, Wu Yen, Enton Green, near Godalming, Surrey. Secretary: O. Webb. Registered office: 90, Hatton Garden, E.C.1.

Woodgate and Elsworth, Ltd.—Private company. Registered August 22nd. Capital, £500 in £1 shares. Objects: To carry on the business of dealers in all kinds of electrical stores, apparatus and plant, &c. The directors are:—W. P. Woodgate, High Halden, Kent, builder; H. W. Elsworth, 37, Western Road, Bexhill-on-Sea, electrician; Mrs. N. Woodgate, High Halden, Kent. Secretary: Mrs. N. Woodgate. Registered office: Summerhill, High Halden, Kent.

Reflex Advertising Co., Ltd.—Private company. Registered August 23rd. Capital, £4,000 in 20,000 ordinary shares of 1s. each and 3,000 10 per cent. participating preference shares of £1 each. Objects: To carry on the business of advertising agents, manufacturers and general factors of electrical goods and advertising signs of all kinds, &c. The subscribers (each with one preference share) are:—H. M. Williamson, publicity agent; and R. Miles, advertising manager, both of 124, Minories, E.C.3. The first directors are B. E. Measures and J. V. Mitchison. Solicitors: Barclay, Morgan, Griffiths & Co., 124-7, Minories, E.C.3.

Road and Rail Publicity, Ltd.—Private company. Registered August 22nd. Capital, £5,000 in 4,000 10 per cent. cumulative preference and 1,000 ordinary shares of £1 each. Objects: To carry on the business of publicity and advertising agents and contractors; mechanical and electrical engineers, moving sign manufacturers, &c. The subscribers (each with one ordinary share) are:—N. MacLaren, The Old Knoll, Blackheath, S.E., journalist; J. E. Pickles, 14, Gunnersbury Lane, Acton, W.3, advertising agent. Solicitors: Kimbers, Williams & Co., 79, Lombard Street, E.C.

Instrument Wires and Cables, Ltd.—Private company. Registered August 20th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical, mechanical, wireless and general engineers, manufacturers of and dealers in electrical and mechanical apparatus, appliances, cables and wires, insulated and otherwise, &c. The life directors are:—A. W. Scott, 19, Chestnut Road, West Norwood, solicitor; J. L. Harper, Churchgate, Westerham, C.A. Registered office:—218, Homeside Road, Bickley, Kent.

Truphonic, Ltd.—Private company. Registered August 24th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a merchant of and dealer in wireless, electrical apparatus and appliances, &c., carried on by G. E. Spero at 121-3, Rosebery Avenue, E.C., as the "Truphonic Wireless Co." The subscribers are: T. L. Simmons, 49-50, Newgate Street, E.C.1, articled clerk; G. W. R. Rees, 113, Strone Road, Forest Gate, E.7, solicitor's clerk. G. E. Spero is permanent managing director and chairman. Registered office: 121-3, Rosebery Avenue, E.C.

Mears Earphone Co. (London), Ltd.—Private company. Registered August 24th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers, importers, exporters and hirers of, agents for and dealers in earphones, microphones and instruments of all kinds for aiding the deaf to hear, &c. The directors are: R. Hughes, 186, Nelson Road, Crouch End, N.8, acoustician; Nellie Hughes, 186, Nelson Road, Crouch End, N.8, acoustician. Secretary: Miss O. M. Dawson. Registered office: New Courts Chambers, 57-58, Chancery Lane, W.C.

Official Returns of Electrical Companies.

Berry's Electric, Ltd.—Satisfaction in full on June 4th, 1928, of equitable charge dated January 3rd, 1921, and mortgage dated March 21st, 1921, substituted therefor, securing company's bank overdraft.

Newquay Electric Light and Power Co., Ltd.—Satisfaction in full (1) on December 31st, 1925, and October 19th, 1926, of third mortgage debentures dated March 4th, 1919, securing £1,000; (2) on July 31st, 1928, of debentures dated July 25th, 1922, securing £8,000; and (3) on October 10th, 1922, and July 31st, 1928, of debentures dated June 30th, 1906, securing £4,000.

Bastian Meter Co., Ltd.—J. C. Helme, of 11, Queen Victoria Street, E.C.4, was appointed receiver and manager on August 9th, 1928, under powers contained in first mortgage debentures dated October 27th, 1926, and March 21st, 1928.

Woolldridge Radio Co., Ltd.—S. J. Evans, F.A.I., of 31, Brook Street, W., was appointed receiver by Order of Court dated August 10th, 1928.

Premier Accumulator Co. (1921), Ltd.—Capital, £40,000 in £1 shares. Return dated July 24th, 1928. All shares taken up. £18,749 paid (being £1 per share on 11,249 and 15s. per share on 10,000 shares). £18,751 considered as paid on 18,751 shares. Mortgages and charges nil.

Sphere Investment Trust, Ltd. (formerly United Electric Tramways of Montevideo, Ltd.).—Capital, £1,000,000 in 500,000 preference and 500,000 ordinary shares of £1 each. Return dated July 6th, 1928. All shares taken up. £295,105 paid on 131,105 preference and 164,000 ordinary shares. £704,895 considered as paid on 368,895 preference and 336,000 ordinary shares. Mortgages and charges nil.

China and Japan Telephone and Electric Co., Ltd.—Capital, £75,000 in £1 shares. Return dated May 8th, 1928. 39,761 shares taken up. £25,000 paid. £14,761 considered as paid. Mortgages and charges nil.

Wolverhampton and District Electric Tramways, Ltd.—Capital, £200,000 in £5 shares. Return dated May 9th, 1928. 32,200 shares taken up. £159,812 10s. paid (being £5 per share on 31,950 and 5s. per share on 250 shares). Mortgages and charges, £26,000.

Ilfracombe Electric Light and Power Co., Ltd.—Capital, £35,000 in £5 shares. Return dated May 28th, 1928. 6,000 shares taken up. £30,000 paid. Mortgages and charges nil.

Charles Warren, Ltd.—Capital, £6,000 in £1 shares. Return dated July 14th, 1928. 5,700 shares taken up. £1,500 paid. £4,200 considered as paid. Mortgages and charges nil.

Seaton and District Electric Light Co., Ltd.—Capital, £10,000 in £1 shares. Return dated March 28th, 1928. 7,625 shares taken up. £7,625 paid. Mortgages and charges, £6,000. Returns of allotments made, April 28th and June 23rd, 1928, show a further 2,375 ordinary shares allotted, payable in cash, and fully called up.

Colombo Electric Tramways and Lighting Co., Ltd.—Capital, £150,000 in £10 shares. Return dated June 26th, 1928. 13,084 shares taken up. £840 paid. £130,000 considered as paid. Mortgages and charges nil.

Ashton Electrical Co. (Preston), Ltd.—Capital, £1,500 in 250 founders' and 1,250 ordinary shares of £1 each. Return dated July 11th, 1928. All shares taken up. £1,350 paid on 250 founders' and 1,100 ordinary shares. £150 considered as paid on 150 ordinary shares. Mortgages and charges nil.

Embleton & Barker, Ltd.—Capital, £1,000 in £1 shares. Return dated May 29th, 1928. All shares taken up. £500 paid. £500 considered as paid. Mortgages and charges nil.

Europe and Azores Telegraph Co., Ltd.—Capital, £200,000 in £10 shares. Return dated July 19th, 1928. All shares taken up. £144,320 paid. £55,680 considered as paid. Mortgages and charges nil.

Culm Valley Electric Supply Co., Ltd.—Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1 each. Return dated May 31st, 1928. 8,500 ordinary shares taken up. £7,900 paid. £600 considered as paid. Mortgages and charges nil. Return of allotments made June 29th, 1928, shows a further 988 preference and 3,954 ordinary shares allotted as fully paid as part payment for certain shares of the Bradninch and District Electric Supply Co., Ltd.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—Capital, £4,000,000 in £10 shares. Return dated August 9th, 1928. All shares taken up. £4,000,000 paid. Mortgages and charges, £752,400.

Birmingham District Power and Traction Co., Ltd.—Capital, £700,000 in 250,000 preference and 450,000 ordinary shares of £1 each. Return dated May 9th, 1928. 146,846 preference and 412,934 ordinary shares taken up. £559,780 paid. Mortgages and charges, £258,353 4½ per cent. debenture stock.

Cuba Submarine Telegraph Co., Ltd.—Capital, £220,000 in 16,000 ordinary and 6,000 preference shares of £10 each. Return dated June 14th, 1928. All shares taken up. £220,000 paid. Mortgages and charges nil.

City Notes.

West Wilts. Electric Light and Power Co., Ltd.

Mr. A. A. Douglas (chairman) presided at the annual meeting recently and presented accounts showing a net profit of £1,609, to which was added £360 brought forward, making £1,969. The chairman said that considerable progress had been made during the past year; the sales had risen from 464,126 to 1,418,046 kWh, and applications for a supply were still being received satisfactorily. The accounts were adopted and an ordinary dividend of 5 per cent. was approved. Subsequently a resolution was passed increasing the capital of the company to £100,000 by the creation of 8,000 £5 cumulative preference shares and 25,000 £1 ordinary shares. In response to a suggestion the directors promised to consider the division of the new £5 shares into £1 shares.

Burndept Wireless, Ltd.

At a special meeting on August 21st resolutions for the reconstruction of the company were confirmed. Mr. J. G. Scott, who presided, announced that the following gentlemen would constitute the board of the new company: Mr. C. W. Rooke, Mr. W. H. Lynas, Lt.-Col. Adrian Simpson, Mr. T. A. Barson, and Capt. W. Horridge.

Stock Exchange Notice.

Dealings in the following securities have been specially allowed by the Committee under Rule 159:—
Postal Telegraph and Cable Corporation.—£18,495 five per cent. collateral trust debenture stock; $9,174 five per cent. collateral trust gold bonds and fractional scrip certificates.

Bognor Gas and Electricity Co., Ltd.

Interim dividends as follows have been declared:—At the rate of 8 per cent. per annum on the original and additional "A" ordinary consolidated stocks; at the rate of 9.2 per cent. on the original "B" ordinary consolidated stock; and at 7 per cent. per annum on the new consolidated stock.

W. Canning & Co., Ltd.

An interim dividend at the rate of 5 per cent. per annum has been declared. No interim distribution was made in 1927, when a final dividend of 10 per cent., plus 2½ per cent. bonus, was paid.

Edmundsons' Electricity Corporation, Ltd.

At an extraordinary meeting on August 23rd resolutions were passed providing for the creation of 800,000 new ordinary shares of £1 each (raising the capital to £1,650,000), and for the capitalisation of £600,000 of the company's undivided profits standing to reserve.

Davis & Timmins, Ltd.

The directors again recommend an interim ordinary dividend at the rate of 6 per cent. per annum, free of tax, for the half-year ended June 30th.

Newcastle-upon-Tyne Electric Supply Co., Ltd.

An interim dividend of 2½ per cent. has been declared on the ordinary shares, as in 1927.

City of London Electric Lighting Co., Ltd.

An interim dividend at the rate of 10 per cent. per annum has been declared on the ordinary shares, as in 1927.

Stocks and Shares.

Monday Evening.

One of the outstanding features in the Stock Exchange markets is the continued attention that is being paid to Electric Lighting and Power shares. There would be considerably more market activity than exists at present were it not for the difficulty that the investor experiences in buying the shares that he particularly requires. In a number of cases there are literally no shares to be obtained, while in many others the amount on offer is almost negligible: not more than suffices to satisfy a very small demand when this arises. People are wanting to put capital into the shares of the industry, and, as we have pointed out on previous occasions, investors are content to pay prices at which the return on the money is meagre. This applies more particularly to the shares of the lighting and power companies of the provinces, the prospects of which are regarded as promising, not so much for a few months on, as for two or three years hence. The Government's legislation in connection with the supply of electrical energy throughout the country has had a great deal to do with the quickening of attention paid to shares in this branch of commerce, and although in some few cases the best prices recently attained by shares in leading companies have not been fully held, the reaction is of no consequence compared with the previous rises that have occurred. From the market point of view it is a good thing for prices to slip back every now and then, because this has the effect of bringing in shares for sale on behalf of people who, by realising, are able to secure substantial profits, and whose selling provides a fresh supply of shares to meet the steady stream of buying that goes on almost continuously.

Midland Counties.

The yields obtainable are, as already mentioned, meagre in the majority of instances. Midland Counties Electric Supply return, as our lists show, a little over 4 per cent., but may be said to have as good a chance as any in the group for capital appreciation, in spite of the slender yield now obtainable. The company increased its dividend last year from 6 per cent. paid for 1926, to 6½ per cent., and the impression prevails that the distribution will be advanced, as opportunity offers, to 8 per cent. To reach this rate will naturally require some time. Northampton Electric Light Power ordinary shares have been changing hands freely on the basis of 42s., a price at which they return a yield on the money of £4 5s. 9d. per cent. For the three years 1925 to 1927 inclusive, the company paid an annual 9 per cent. dividend, and an interim dividend this year at the rate of 8 per cent. is held to imply that the final dividend for 1928 will enable the company to make a better showing than it has done hitherto.

Power Companies.

Scottish Power ordinary retain their rise at 33s., at which the shares pay £4 17s. per cent. The new shares, which came out at 26s. not long ago, now stand at 32s. 6d. Newcastle-upon-Tyne Electric ordinary are coming into favour again, as we have lately shown, and yield nearly 4¾ per cent. on the money. It is impossible to work out the yield on Midland Electric Corporation for Power Distribution ordinary shares because the 15 per cent. dividend for 1927 was followed by a share bonus of 100 per cent. A block of Delhi Electric Supply and Traction ordinary shares recently overhanging the market is being absorbed, and the price has improved to 53s. 9d., at which the yield on the basis of the last paid 12 per cent. dividend is 4½ per cent.

London Electricity Companies.

The London list of electricity supply shares is hard, City of London ordinary standing out with a rise of 2s. 6d. to 33s. 3d. The company has declared, again, an interim dividend at the rate of 10 per cent. Chelseas are 1s. better at 27s. 6d., and Bromptons 6d., at 27s. It may be noticed that there is no more than 1s. difference between the prices of ordinary shares in the Brompton, Chelsea, Charing Cross, Kensington, London Electric, St. James', South London and Westminster Companies, the middle prices of whose shares range from 26s. 6d. to 27s. 6d.

Additional Prices.

Of electricity issues not quoted in our regular weekly list, it may be serviceable to quote such examples as North Wales Power ordinary at 17s. 9d., Electrical Finance and Securities ordinary 32s., and the 7 per cent. preference 23s. 6d.; Harrow 4½ per cent. preference 3¾, Chiswick ordinary £3, East African Power and Lighting, 27s. 6d., and the 7 per cent. preference 23s. 9d. Business is being done in Altrincham Electric Supply 7 per cent. second preference on the basis of 22s. 3d., Yorkshire Electric Power new ordinary 24s. 6d.—a premium of 10s. on these 14s.-paid shares offered at 24s.—and Notting Hill Electric Lighting deferred at 5¼. Fife Tramway Light and Power 5½ per cent. five-year notes changed hands at 100 two or three weeks ago, when business took place in the company's 5 per cent. debenture stock at 89. London Power 5 per cent. debenture, of this year's date, has been marking in the Stock Exchange Lists at 103¼. Sevenoaks and District Electricity were done at 26s. for the ordinary and 25s. 6d. for the 8 per cent. preference, so long ago as last April. In Colne Valley Electric Supply 5½ per cent. debenture stock there is a transaction marked at 99½ a month back. Buenos Aires Lacroze Light and Power 6½ per cent. debenture stock was dealt in, at 100½, about a fortnight ago.

Latin-Americans.

The Latin-American utility stocks are better as regards the two principal performers. Hydro-Electrics, down to 26 just lately, sprinted to 34 on rumours to the effect that a Belgian syndicate had taken over the interests of the late Mr. Alfred Loewenstein. International Holdings came up, from 12 to 12¾, and Sidros improved to 18. Brazilian Tractions maintain their recently-regained strength. In the Mexican descriptions,

a point decline in the 5 per cent. bonds of the Mexican Electric Light Company has lowered the price to 75, at which the yield on the money comes to 6⅔ per cent. The bonds are redeemable at par in 1942, and, assuming repayment to be made at due date, the return is raised to 8¾ per cent. Mexican Light and Power Company, whose common shares stand at 71, guarantees principal and interest of the Mexican Electric Light bonds. The interest on the latter is duly paid in January and July. It need hardly be added that the price of the bonds implies the measure of the security judged by Stock Exchange standards. Mexico Tramways shares have risen 4¼, to 37½, being again bought as a useful speculation. In mentioning this view last week, the further opinion was hinted that the possibility of a dividend payment appeared indefinite. The Anglo-Argentine stocks are unchanged. Bermuda Traction new debentures strengthened to 4 discount, and the shares at 12s. 6d. are 6d. higher on the week.

Tube Railway Stocks.

Slight reaction took back Underground Electric Railways of London £1 shares to 26s. 6d. The income debentures rallied to 130 after being lower. The days are long past since the Home Railway market provided its stocks with ladies' names, but the activity in Undergrounds has necessitated abbreviation of that title into something shorter, and still associated with, though not monopolised by, the fairer sex. London Electric Railway ordinary stock is better at 72½, Districts rose 1¼ to 79, Metropolitan ordinary keeping at 66½. London and Suburban Traction are steady at 10s. 6d. London United Tramways ordinary have found a little support at 1s. 3d. to 1s. 6d. Metropolitan Electric Tramways ordinary last changed hands at 6d. on July 31st, and business was marked at 6s. in the company's 5 per cent. preference on September 8th.

Stock Exchange Quotations.

It may interest some people not familiar with Stock Exchange usage to hear that when a bargain is done between members there is no compulsion laid upon either buyer or seller in the matter of marking it. This is a voluntary affair: literally, thousands of the bargains done every day are not marked. When the last marking in the Stock Exchange Lists is more than a business-day old, the date is put against it in brackets. In references made here to bargains in rarely-negotiated stocks and shares, the dates of the last-recorded transactions are taken from the Stock Exchange Lists. If no mark appears against a quoted stock or share during a period of twelve months, the security is removed from the List as being one which attracts insufficient public attention to warrant its having a place in the List.

Marconis.

Marconis at 66s. 3d. are 1/16 up. The Loewe case, in which the company figured at the end of last week, and the judgment in which permitted certain modifications in regard to the licence-fees charged by the Marconi Company, has had no effect upon the price of the shares. Some people thought it would bring about a weakness of the quotation, and, at the outset of business on Monday morning of this week a little nervousness was shown with regard to the price at which the shares would open. The matter is regarded, however, as being of no particular consequence, and, as already stated, the price is 1/16 higher on balance. The report issued by the Comptroller General of Patents on the subject of Marconi broadcasting royalties generally, appeared after the close of the market on Monday.

Inquiries constantly reach the Stock Exchange as to whether there is any value for the Assets Certificates that remain in the hands of the American Marconi shareholders. The latter duly received their radio certificates, and have been able to deal with these if they wished to do so, but the Assets Certificates, which are supposed to be worth about 2d. each, cannot be transferred. The holder on this side has, therefore, little option in regard to what he ought to do. It is thought that one of these days there might be some value attached to the oddments.

Cable and Manufacturing.

In the Cable group, Eastern Telegraph ordinary has gone back five points to 240, but no other alterations occurred. Oriental Telephone ordinary rose ½ to 56s. 3d. United River Plate Telephones continue depressed at 9¼. It is understood that the chairman is now negotiating on the spot with the Argentine Government in respect to the rates which the company is permitted to charge. The manufacturing list is firm as a whole. General Electric ordinary rose 2s. 6d. to 40s. 6d.; Siemens have gained 6d., at 28s. 9d. British Aluminium at 44s. 6d. are 9d. higher. Metropolitan-Vickers put on a similar amount, at 33s. 3d., on account of three contracts that the company has secured with a total value of nearly three-quarters of a million pounds sterling.

International Telephone and Telegraph stock strengthened to 186¼. Amongst other changes may be mentioned a point improvement, to 102½, in Tata Power 7½ per cent. "B" debenture. Perak River Hydro-Electrics drooped to 19s. Rubber shares went back in sympathy with a shrinkage in the price of the raw product. Vickers have been supported from the North of England.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	1927.	Price Aug. 27, 1928.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	£1	14†	15	3⅛	—	... ...
Brompton Ordinary	£1	8⅜	8½	27/-	+6d.	5 3 8
Charing Cross Ordinary	£1	8½	8½	27/-	—	5 3 8
do. do. 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Chelsea	£1	8⅞	8⅞	27/6	+1/-	5 1 10
City of London	£1	10	10	33/3	+⅛	4 4 4
do. do. 6% Pref.	£1	6	6	23/6	—	5 2 2
Clyde Valley	£1	8	8	37/6	—	4 5 3
County of London	£1	7½	7½	38/6	—	3 18 3
do. do. 6% Pref.	£1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	£1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	£1	11	11	2⅛	—	4 8 0
Kensington Ordinary	£1	8	8	26/6	—	5 5 8
Lancs. Light and Power	£1	7½	7½	30/-	—	5 0 0
London Electric	£1	8½	9½	27/6	—	5 1 10
Metropolitan	£1	8	9	2 7/16	—	3 13 9
do 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Midland Counties	£1	6	6½	31/6	—	4 2 6
Mid. Elec. Power	£1	—	15	43/9	—	... ...
Newcastle-on-Tyne Ordinary	£1	5	6	25/9	—	4 13 2
do. 7% Pref.	£1	7	7	26/6	—	5 5 8
Notting Hill 6% Pref.	£10	6	6	10⅜	—	5 11 7
North Met. Elec. 6% Pref.	£1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	£5	8	8	27/6	—	5 1 10
Scottish Power	£1	8	8	33/-	—	4 17 0
South London	£1	8½	8½	26/6	—	5 5 8
Urban Ordinary	£1	7	7	35/-	—	... ...
Westminster Ordinary	£1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	24/-	—	6 5 0
Yorkshire Elec.	£1	8	8	36/-	—	4 9 0
Home Rails.						
Central London Ord. Assented	Stock	4	4	73	—	5 9 7
Metropolitan	,,	3	3	66½xd.	—	4 10 3
do. District	,,	3½	4	79	+1½	5 1 3
Underground Electric	£1	1½	5	26/6xd	—6d.	3 15 6
do. do. Income	Bonds	6	6	130	+3	4 12 4
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 5
do. Def.	,,	1½	1½	24½	—	6 3 9
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	24½	—	*4 2 8
Eastern Tel. Ord.	Stock	10	10	240	—5	*4 3 4
Globe Tel. and T. Ord.	10	10	10	24½	—	*4 2 8
do. do. Pref.	10	6	6	11⅛	—	5 7 10
Great Northern Tel.	10	20	20	38	—	5 5 3
Indo-European	25	10	10	45½	—	*5 10 0
Marconi	10/-	5	*10	3 1/16	+1/16	... ...
Marconi-Marine	1	8¾	12½	51/-	—	4 18 1
Oriental Telephone Ord.	1	12	12	56/3	+⅛	*4 5 3
United R. Plate Tel.	5	8	8	9¼	—	*4 2 1
Western Telegraph	10	10	10	24½	—	4 2 8
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3⅝	—	7 11 9
do. do. 2nd. Pref.	5	6	6	3½	—	8 11 6
do. do. 5% Deb.	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	520	—	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	56½	—	3 2 0
Brit. Colombia Elec. Rly. Pcs.	Stock	5	5	96⅜	—	5 3 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/6	—	... ...
London United Tram Deb.	Stock	4	4	60⅜	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	79	—	6 6 7
Mexican Light Common	100	Nil	Nil	71	—	... ...
do. 7% Pref.	100	Nil	7	77½	—	9 0 8
do. 1st Bonds	—	5	5	80½	—	6 4 3
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	1	13	15	67/6	—	*4 9 0
British Aluminium Ord.	1	10	10	44/6	+9d.	*4 10 2
British Elec. Transformer Pref.	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4¼	—	3 10 6
Brush Ord.	1	10	10	28/3	—	7 2 10
Callenders	1	15	15	4¼	—	3 12 6
do 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Pref Ord.	1	—	6	17/6	—	6 17 2
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	88	—	5 13 8
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4¾	—	4 11 6
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	40/6	+2/-	4 19 0
Henley	1	25	25	5½	—	4 11 0
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	2	—	5 0 0
Met.-Vickers Ord.	1	8	6	33/3	+9d.	3 12 3
do. Pref.	2	8	8	2⅝	—	6 1 11
Siemens Ord.	1	7½	7½	28/9	+6d.	5 4 4
Telegraph Construction	12	10	10	24½	—	*4 18 6

*Interim.

*Dividends paid free of Income Tax.

†4% of which was tax free.

Conditions in Jugo-Slavia.

A Department of Overseas Trade Report.

MR. E. MURRAY HARVEY, O.B.E., M.C., British Commercial Secretary at Belgrade, has submitted to the Department of Overseas Trade a report on economic conditions in the Serb-Croat-Slovene Kingdom (Jugo-Slavia) dated May, 1928. (Stationery Office, 1s. 6d. net.)

In the introductory matter it is noted that the population of the country is 13 millions, 80 per cent. of which is agricultural. In addition to Belgrade (240,000), there are five large towns—Zagreb, Ljubljana, Subotica, Sarejevo and Split. Many languages are in use, but English is little known; German and French are the most useful languages to the foreigner for business purposes.

A certain amount of progress was made during 1927 towards the economic consolidation of Jugo-Slavia, notably in the virtual stabilisation of the national currency; the transference of certain administrative functions from the central government to local authorities; the elaboration of a new law to unify taxation throughout the country; and the development of certain industries. The bad harvest of 1927 had an adverse effect upon general trade, but prospects for the current year appear to be brighter. It is thought that the unit of currency, the dinar, which has been relatively stable for the past three years in the neighbourhood of 9.14 on Zurich will be legally stabilised at about the same figure. (The Swiss franc and the dinar are equal at par values.)

Last year was a bad one for foreign trade. In the three previous years the balance was in Jugo-Slavia's favour, but last year exports fell to about 88 per cent. of the imports, while the total trade declined by 18 per cent. Great Britain supplies about 7 per cent. of the country's needs, but only takes about 1 per cent. of her exports. The high Customs tariff is fostering the home textile industries, but the falling off in textile imports from Great Britain is being compensated for by the purchase of British machinery for the mills. There seems little hope that the demand for British goods for retail sale can be greatly increased for some time at least, but improvement may be looked for in the direction of machinery and technical material. Jugo-Slav manufacturers are insistent in their demands for protective tariffs, with the result that reductions under commercial agreements have been small. However, facilities are granted for the free importation of certain machinery which cannot be made in the country, as a measure of assistance to manufacturers and other users of mechanical power. Industrialists have complained that the list which has been compiled of machinery which can be made in the country includes many items which cannot be so produced. Jugo-Slav industrialists have to face a number of difficulties, including the dearness of money, high State and local taxation, lack of skilled native personnel, and the disinclination of the authorities to permit the unconditional and permanent employment of foreign expert labour. In many cases, industrial enterprises, although registered as local companies, are owned as to the majority of their shares, as well as financed, by foreigners or local banks, which themselves derive their finance from their connections abroad. The timber, textile and beet-sugar industries are prominent examples of this.

Among the improvements which are being carried out is the extension of the telephone system. Automatic exchanges, the material for which was obtained from Germany on reparations account, have been installed at Novi Sad and Zagreb, and the Belgrade exchange is also to be converted to the automatic system. Telephonic communication with many large European towns is in existence, and will shortly be established with Zurich and Paris. Tenders have been received for an important system of underground telegraph cables, and the necessary equipment, relay stations, &c., to provide a number of lines for international service. The scheme is estimated to cost some 300 million dinars (over £1,000,000), and the firms tendering were asked to arrange for payment to be spread over at least 12 years. There has been a certain increase in the number of radio sets in use, there now being some 12,000 throughout the Kingdom, of which 8,000 are in Zagreb alone. The apparatus in use is principally of the cheaper Austrian and German makes. The broadcasting station at Zagreb will shortly be supplemented by one at Belgrade, for which a local company has recently obtained the concession; the apparatus will be supplied by Marconi's Wireless Telegraph Co., Ltd. A further station is to be erected at Ljubljana, for which the material will be obtained on reparations account. The Ministry of Posts and Telegraphs now possesses a small 10-W experimental broadcasting station. The new Belgrade station is to be of 9 kW, and it is expected that on its completion much more general interest in radio will be taken in the capital.

The Corean Machinery Market.

Greater British Interest Essential.

IN the course of a report on the market for engineering, machinery, &c., in Corea, the British Consul-General at Seoul (Mr. Oswald White) says that during a recent visit he was very much struck with the engineering activity, notably in schemes for the extension of communications (railways and roads), the development of resources of power (hydro-electric), barbour works, &c. Although the percentage of orders for machinery and material which go to Europe and America is small in nearly every case, in the aggregate they amount to a fairly large sum. It is more than possible that under certain conditions the proportion could be considerably increased. Mr. White gathers the impression that, while Great Britain is doing a fair trade, she is not getting the share which she might expect, and that there is a danger of her falling behind in the future. Discussions with certain leading importers and with the Government Railway Bureau confirms the view that Great Britain is standing still while the United States of America and Germany are going ahead. The Consulate General reported during the past year on the Chosen hydro-electric power scheme near Kanko (Hambeung), with which is associated a plan to erect an artificial fertiliser plant. For the supply of pipe-lines four makers or syndicates were in the field—Polish, American, German and Italian. The first got the order. The orders for power stations, electrical equipment, &c., have gone to Siemens (Germany) and the Shibaura Works (Japan). Something of the same sort occurred over the contracts for the fertiliser plant. Now hydro-electricity is supposed to be very promising in Corea. As new works are undertaken, there will be a natural tendency for orders to go where they have been placed before. The Railway Bureau stated that in the matter of reference catalogues, &c., there were fewer British than American and German; in certain lines British makers are not represented at all.

The British maker claims that his is a superior article justifying a higher price, to which the reply is: "We do not require a superior article of that kind." The Railway Bureau recently obtained three quotations for a thirty-ton crane. The tenders were 14,000 yen (British), 11,000 yen and 7,000 yen (American). The last was purchased. It is very roughly finished off, and its life will probably be only half that of the British crane, but it does the work required of it. It is easier for a Government Department to buy the cheaper rather than the dearer of two articles. The prestige of British machinery is high in the Far East as elsewhere, but—so say the purchasers—more British machinery would be sold if it was cheaper. And, it is added, some sacrifice might with safety be made in the matter of finish and margin of efficiency. Price, however, is not everything. The British manufacturer is not in close enough touch with the market. Inquiries as to why the import houses are so rarely able to place an order in Great Britain are met with the stock reply that British machinery and equipment are too expensive, but further questioning elicits the fact that, except in odd cases, no inquiry has been sent to Great Britain. The idea of sending it simply does not occur, or, if it does, is dismissed because the importer knows where he can get the machinery in America or Germany, whereas to him Great Britain is an unknown quantity so far as that particular machinery is concerned. The feasibility of the opening of a branch office to represent the British manufacturer is ruled out on the score of expense. It could not get orders unless a trained staff were employed. There is danger also that the established import houses would combine to keep orders from it. The only remaining solution seems to be to work as before through the existing import houses, but to establish some machinery or other to bring them into closer touch with the British manufacturer. There are three, if not more, possible methods of effecting this. The first is possibly the simplest. It is to interest the London branches of the principal local import houses in British machinery suitable for the Corean market. Their names can be obtained on application to the Department of Overseas Trade. Catalogues and literature sent to these import houses might be of some use, but, while it would be a step in the

right direction, it would not in itself be sufficient. The second method is to have a travelling representative. This would probably have a good effect and would be worth while if the tour could be linked up with other territories which promised results. In addition to calling upon firms, he could interest the Railway Bureau and Government engineering offices. The third method is, if it could be arranged, to station a representative in the office of one of the import houses. He would need to represent a group of manufacturers. This method has been employed with success in Japan itself.

Mr. White suggests that it would pay to send out a trained representative to survey the ground, to report what lines are promising, and to make suggestions as to the best means of securing trade.

The Railway Bureau map which accompanies the report indicates pictorially the great development of the railway system of Corea in the last few years and the equally great development which is planned for the future. Another map shows the hydro-electric resources, and indicates that there are five power schemes of 50,000 h.p. or over in the neighbourhood of Kanko or Hamheung, on the north-east coast. The railways, roads, hydro-electric schemes, harbour works and irrigation projects create a demand for specialised machinery and supplies to which British manufacturers might well devote increased attention. Of the cost of most of these works a very large proportion represents labour, and the bulk of the orders for machinery and material will naturally be placed in Japan. But there still remains a fair proportion that will go to other countries.

Electrical Imports of British Malaya.

Comparison of Two Years' Figures.

BELOW are given the values during 1926 and 1927 of the imports of electrical and allied material into British Malaya, together with notes of increases or decreases in the trade :—

	1926.	1927.	Inc. or dec.
Wire and cable, insulated—	$	$	$
Total	1,369,000	1,605,000	+236,000
From United Kingdom ...	1,233,000	1,549,000	+316,000
,, Japan	5,500	17,100	+ 11,600
,, United States ...	8,000	13,600	+ 5,600
Telegraph and telephone instruments and apparatus—			
Total	538,000	658,000	+120,000
From United Kingdom ...	517,000	642,000	+125,000
,, United States ...	6,000	1,500	– 4,500
,, Continent of Europe	9,000	7,700	– 1,300
Electric lamps and parts—			
Total	48,500	50,600	+ 2,100
From United Kingdom ...	29,000	18,200	– 10,800
,, Continent of Europe	14,600	29,000	+ 14,400
Electric lamp bulbs—			
Total	440,000	458,000	+ 18,000
From United Kingdom ...	235,000	225,000	– 10,000
,, Continent of Europe	83,000	125,000	+ 42,000
,, United States ...	39,000	43,600	+ 4,600
,, Japan	34,000	58,000	+ 24,000
Batteries and accumulators—			
Total	357,000	556,000	+199,000
From United Kingdom ...	76,000	94,000	+ 18,000
,, Japan	24,500	11,500	– 13,000
,, United States ...	176,000	388,000	+212,000
Electric lighting accessories and fittings—			
Total	181,000	240,000	+ 59,000
From United Kingdom ...	101,000	165,000	+ 64,000
,, Continent of Europe	28,000	21,000	– 7,000
,, Japan	36,000	47,500	+ 11,500
,, United States ...	5,800	3,000	– 2,800
Electrical goods and apparatus (not machinery) not elsewhere mentioned—			
Total	1,294,000	1,876,000	+582,000
From United Kingdom ...	707,000	1,147,000	+440,000
,, Continent of Europe	184,000	158,500	– 25,500
,, United States ...	293,000	538,000	+245,000
Electric generators—			
Total	108,000	128,000	+ 20,000
From United Kingdom ...	78,000	117,000	+ 39,000
,, Continent of Europe	21,600	8,100	– 13,500
,, United States ...	3,200	—	– 3,200
Motors—			
Total	409,000	367,000	– 42,000
From United Kingdom ...	338,000	260,000	– 78,000
,, Continent of Europe	28,600	53,200	+ 24,600
,, United States ...	30,000	40,000	+ 10,000
Ignition magnetos—			
Total	40,000	41,000	+ 1,000
From United Kingdom ...	12,600	5,000	– 7,000
,, Continent of Europe	20,000	31,500	+ 11,500
,, United States ...	6,800	4,000	– 2,800
Other electrical machinery—			
Total	1,373,000	1,419,000	+ 46,000
From United Kingdom ...	1,180,000	974,000	–206,000
,, Continent of Europe	91,000	406,000	+315,000
,, United States ...	80,000	27,000	– 53,000

Electrical Imports of New Zealand.

The Figures for 1926 and 1927 Compared.

THE following table shows the values of electrical and allied goods imported into New Zealand in 1927, according to the recently-issued official trade returns. The figures for 1926 have been given for purposes of comparison, and notes of increases or decreases added :—

	1926. Thous.	1927. Thous.	Inc. or dec. Thous.
Electric batteries and cells—	£	£	£
Total	126	151	+25
From United Kingdom	24	37	+13
,, United States	78	93	+15
,, Canada	22	19	– 3
,, Denmark	1	1	—
Generators, motors and transformers—			
Total	564	518	–46
From United Kingdom	279	320	+41
,, United States	113	89	–24
,, Sweden	116	31	–85
,, Canada	17	17	—
,, Belgium	7	2	– 5
,, Germany	14	40	+26
Insulated cable and wire—			
Total	571	520	–51
From United Kingdom	535	485	–50
,, United States	10	7	– 3
,, Australia	1	3	+ 2
,, Canada	11	10	– 1
Electric lamps (incandescent filament)—			
Total	151	54	–97
From United Kingdom	90	100	+10
,, Netherlands	31	29	– 2
,, United States	15	17	+ 2
,, Austria	9	2	– 7
Other electric lamps—			
Total	33	27	– 6
From United Kingdom	6	4	– 2
,, United States	23	17	– 6
Carbons in blocks, &c.—			
Total	29	23	– 6
From United Kingdom	20	14	– 6
,, United States	6	6	—
,, Australia	—	1	+ 1
Telegraph and telephone material—			
Total	296	380	+84
From United Kingdom	107	94	–13
,, United States	156	178	+22
,, Belgium	16	72	+56
,, Netherlands	5	12	+ 7
Other electrical material—			
Total	593	648	+55
From United Kingdom	318	354	+36
,, United States	158	125	–33
,, Australia	16	22	+ 6
,, Canada	80	82	+ 2
,, Switzerland	7	11	+ 4
,, Sweden	2	40	+38
Electricity meters—			
Total	78	46	–32
From United Kingdom	76	43	–33
,, United States	1	1	—
Recording and testing instruments and meters—			
Total	87	82	– 5
From United Kingdom	58	50	– 8
,, United States	20	25	+ 5
,, Germany	4	3	– 1
Turbines, steam and water, and Pelton wheels, exceeding 200 b.h.p.—			
Total	31	18	–13
From United Kingdom	28	18	–10
,, Sweden	3	—	– 3

Synchronous Motor Driving.

Messrs. Crompton Parkinson, Ltd., have introduced a system of starting for synchronous motors which results in a starting torque of twice full-load torque.

IN the June 1st (1928) issue of the ELECTRICAL REVIEW, p. 956, some notes were given on the use of synchronous motors in American steel works, in the course of which the statement was made that steel works engineers had hesitated to install this type of motor on account of the starting difficulties, preferring to use induction motors with high starting torque. It is important that no misconception should arise on this point, *viz.*, that the writer of the paragraph was referring entirely to United States practice, and not to British or Continental practice.

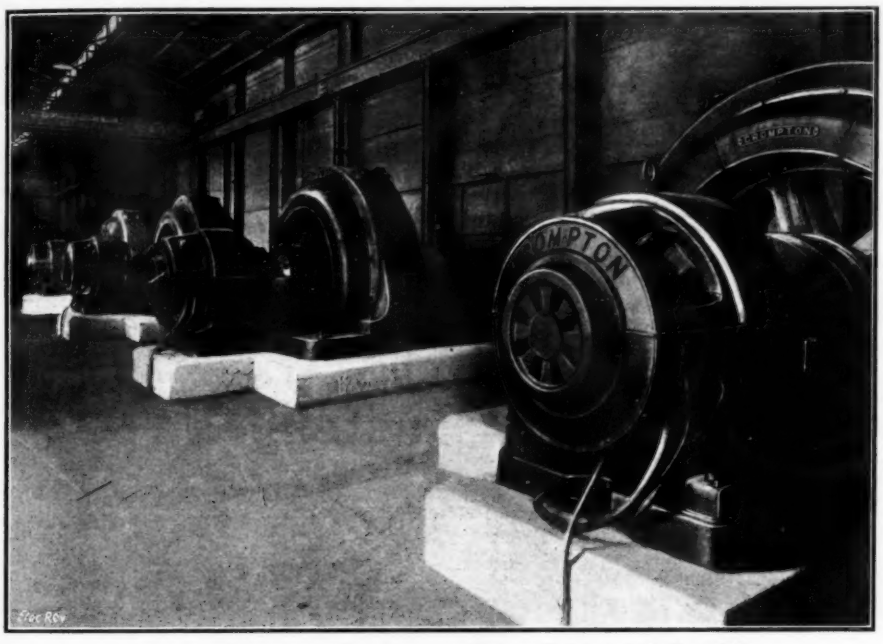


Fig. 1.—750-h.p. Auto-Synchronous Motors Driving Grinding Mills.

In the United States, where electric power as a rule is generated on a much larger scale than in this country, there are fewer limitations to the instantaneous demand which a consumer may impose on the supply than on this side of the Atlantic, and consequently the salient-pole synchronous motor has held its own against the more modern induction synchronous or auto-synchronous type. The salient-pole synchronous motor has embedded in its pole-faces a squirrel-cage copper winding which acts as a starting winding, and also as a damping or steadying winding after the machine is in synchronism.

The development of the auto-synchronous motor has been entirely due to the fact that British practice has been averse to the use of clutches, either of the friction or magnetic type, between the motor and the pulley or shafting. Where the starting torque will never require to exceed from 30 to 40 per cent. of the full-load torque, the salient-pole synchronous motor can be used successfully. It is started by means of an auto-transformer starter or compensator, which reduces the voltage impressed at starting on the terminals, in an exactly similar manner to that in which a large squirrel-cage induction motor is started. When full induction-motor speed has been reached the excitation circuit is closed on to the field winding, and the machine pulls into and continues to run in synchronism, provided the torque does not exceed the pull-out torque, in which case the machine would fall out of synchronism and stall. The starting of air compressors and centrifugal pumps unloaded, and also frequency-changers and motor-generators, does not entail a starting torque exceeding 35 per cent. of full-load, and, consequently, the salient-pole machine can be used, provided there is no objection to a starting current of, say, from 1¼ to 1½ times the full-load current. In the majority of drives, however, the starting torque required is greater than 35 per cent., and therefore the use of auto-synchronous motors is indicated. Such drives are used in connection with colliery fans, endless-rope haulages, flour mills, cement works, brick-making works, rubber mills, hydraulic accumulators, and so on. A typical case of modern British practice is shown in the recent installation of five large auto-synchronous motors for driving grinding mills at Bevans' works at Northfleet of the Associated Portland Cement Manufacturers, Ltd., fig. 1. Each motor has a continuous output of 750 b.h.p. at 158 r.p.m. The supply is three-phase, 3,000 volts, 50 cycles, and when the stator winding is switched on directly in the usual manner the motor starts to revolve slowly as the electrodes of the liquid starter are fully immersed in the starting position. The motor is brought up to speed by lowering the electrodes and thereby decreasing the external resistance in the rotor circuit. When fully down the movable electrodes make contact with the fixed electrodes, thereby short-circuiting the rotor slip-rings, and the motor immediately pulls into synchronism against 1½ times full-load torque.

These motors were manufactured by Messrs. Crompton Parkinson, Ltd., who have patented a system of starting whereby the exciter is in circuit during the whole starting period, and, although the slip-ring voltage at starting is of the order of 1,500, the exciter, being connected to the earthed neutral point of the rotor windings, has no voltage impressed on its windings, but remains at earth potential. When the starter electrodes are short-circuited the exciter builds up its normal voltage, 30 volts in the case in question, and transmits direct current through the one phase of the rotor winding to which it is connected, and the machine then locks into synchronism.

The chief point of interest is the very heavy starting torque required for an impact grinding mill of this description, where the steel balls, weighing nearly 30 tons, are all lying at the bottom of the cylindrical mill and require to be carried round during the first revolution of the mill to the top position, from which they cascade down. The motors are designed to give a starting torque of twice full-load and a synchronising torque of 1½ times full-load torque, and no difficulty has been experienced in practice in starting. The whole operation, which is

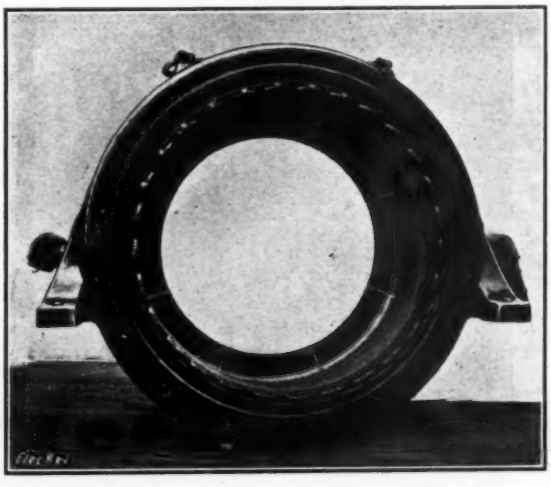


Fig. 2.—Stator with End-shields Removed.

completed in about one minute, is so simple and straightforward that it is difficult for a spectator to realise the very heavy torque which is being exerted to start the unbalanced mass and accelerate it to full-speed.

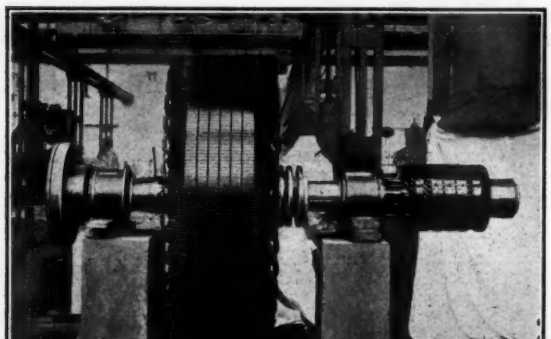


Fig. 3.—Rotor Unit Complete.

The machines in detail present no unusual features. Both the stator and rotor are wound in the standard method adopted by the makers, the joints in the h.p. stator winding being electrically welded by the resistance method after the coils have been inserted in position in the slots. The windings of both rotor and stator are very firmly secured to endless steel rings, thus making relative movement impossible. Fig. 2 shows the stator with the endshields removed, and fig. 3 the rotor complete with a half-coupling.

The exciter armature is pressed on to the end of the main shaft and is overhung, thus obviating the necessity for exciter bearings and shortening the overall length of the machine. The bearings are of the Hoffmann roller type, and, being packed with grease, require practically no attention; in a cement works, where dust prevails everywhere, the advantages of dust-tight ball or roller bearings are obvious. Although the machines run twenty-four hours per day and seven days per week, the bearings run without any appreciable temperature rise.

The starter is interlocked with the oil switch, and the latter cannot be closed unless the starter is in the correct starting position. In a test case of failure of the interlocks current was switched on to the stator with the slip-rings short-circuited, but no movement of the windings could be detected, although the instantaneous current was five times the full-load current.

It is interesting to learn that the makers, who have during the last few years specialised in the manufacture of auto-synchronous motors, have completed nearly 90,000 h.p. of such machines, in all sizes from 10 to 3,000 h.p., and find that the demand continues to increase as the advantages of this type of motor as regards power-factor improvement and easy starting become more generally known.

Metal-Enclosed Switchgear.

In the 33-kV outdoor switching station recently erected at Wheaton, Ill., U.S.A., all the live parts are completely enclosed in earthed metal casings.

IN designing and equipping the new outdoor switching station of the Public Service Co. of Northern Illinois, some particulars of which are given in an article by Mr. H. J. Huber in the July 28th issue of the *Electrical World*, a departure from the usual construction was made, to which we referred in a leaderette in our last issue. The distinguishing characteristic is that all the live parts, including the 33-kV bus-bars and connections, are completely surrounded by earthed metal, so that casual contact with the high-pressure conductors is impossible. If a fault should occur within the sheath it would be prevented from spreading to other circuits. All the operating parts are interlocked mechanically or electrically, or both.

Energy is delivered to the station by overhead lines, underground cables being used from the terminal structure. The main and reserve bus-bars, oil circuit breakers, instrument and auxiliary transformers are mounted outdoors on a massive steel structure, the operating equipment being controlled by suitable apparatus in the sub-station building. Seven circuits are so connected that they can be fed from either the main

Fig. 1.—One Side of Switchgear Structure.

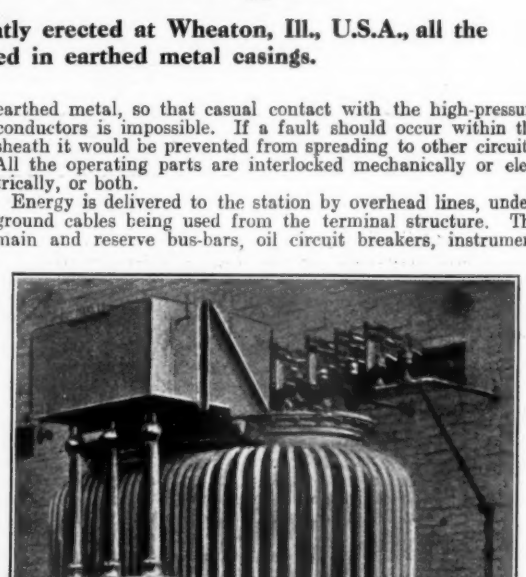


Fig. 2.—Protection for Transformer Connections.

or reserve bus-bar, and each circuit occupies one bay in the eight-bay steel framework. The additional bay is enclosed with steel sheeting to house an elevating truck and travelling carriage, and also serves as an inspection booth.

Earthed metal pipes house the 33-kV bus-bars, and each of the three phases has its own independent set of pipe enclosures, so that there are two walls of earthed metal between any two phases. Expansion joints are used at the junction boxes connecting the pipe sections.

The actual bus-bars consist of copper tubes wrapped with "Herkolite" insulation at the factory, and these at every two or three feet are supported by spools of the same insulation which fit in the enclosing tubes with a slight clearance. Four sides of the spools are cut back to permit free circulation of the oil used to fill the space within the junction boxes and between the conductors and the pipes. Sufficient insulation and clearance to earth are provided throughout the equipment, so that it can run at operating voltage for a short time, even though all the oil has leaked out. The oil is chiefly a medium for filling the spaces between the insulated conductors and their enclosures; the provision of additional insulation is only a secondary function. Flexible connectors are used between the bus-bar sections and between the bus-bars and apparatus with which they are connected.

The oil circuit breakers are disconnected from their circuits by lowering them bodily by a travelling motor-operated elevator. The circuit breaker may be dropped to supports at the "disconnected" position, where its mechanism may be tested or its tanks lowered to permit inspection of the contacts, or it may be lowered to the "transport" position and rolled into a repair house at one end of the structure. If desired, another breaker may be substituted for the one removed. The breakers are held in the "connected" position by six cams, mounted on the girders of the breaker housing, which engage lugs on the breaker unit. The cams are moved by a hand-wheel through a large worm gear-and-screw mechanism powerful enough to lift the breaker.

The circuit breakers are rated at 1,000,000 kVA and 37,000 volts. They are made up of single-pole units bolted together, with a motor mechanism and control-circuit connectors mounted on one end. Connections are made with the main and reserve bus-bar junction boxes at three levels—the bus-bars entering at the upper or lower level and connections at the intermediate level. This arrangement allows any bus-bar section to be removed without disturbing the other sections, since the bus-bars can be installed alternately at the upper and lower levels. Through-type current transformers with the cable entrance below and the connection entrance at the top of the back are used. The potential transformers are equipped with housings and disconnecting contacts similarly to those of the oil circuit breakers, and a separate travelling elevator is provided for handling the transformers and their enclosing tanks. Power for operating the circuit-breaker elevators is obtained by means of connection boxes mounted on the pillars of the station structure under each bay. Each connection-box circuit is interlocked with the control source for its particular bay, so that power is not available for operating the elevator when the corresponding breaker is closed. The elevator is motor-operated from a push-button control station, and a limit switch prevents over-travel in either the up or down direction. When the platform reaches the proper height a plunger enters the interlock box and unlocks the breaker-clamping mechanism.

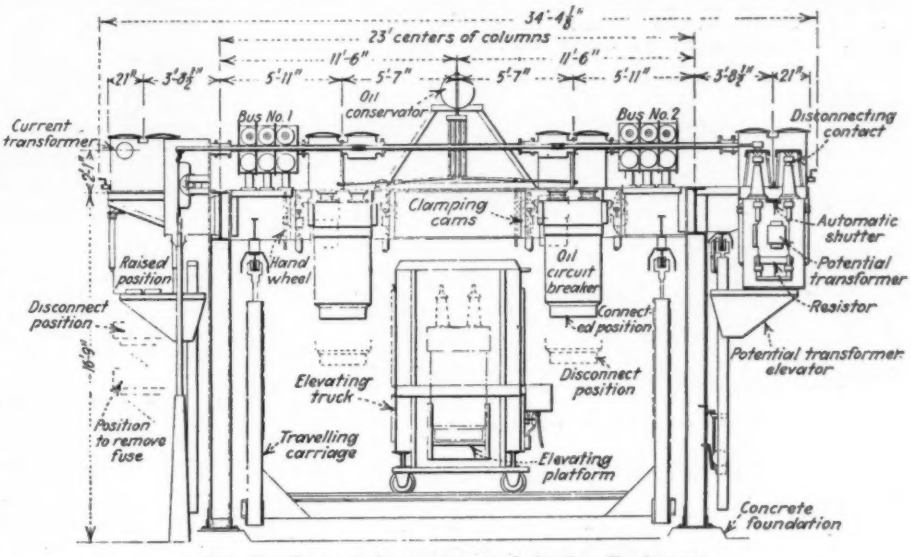


Fig. 3.—General Arrangement of Station Equipment.

The equipment, which has been subjected to a one-minute test at 85,000 V, is designed to give full protection to the operators and men engaged in maintenance work on the high-voltage circuits. Since every current-carrying part and also the insulators are totally enclosed by metal, fire or soot originating near the equipment cannot, it is claimed, affect or damage them, neither can they cause the secondary breakdowns which may occur in the open-type switching equipment.

The unusual metal-enclosure features of the equipment are indicated in the accompanying illustrations, reproduced from the *Electrical World*. Fig. 1 shows one side of the switchgear structure, and fig. 2 shows the h.p. connecting arrangements for one of the auxiliary transformers. The general arrangement of the equipment about the structure may be gathered from examination of the sectional drawing in fig. 3.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

"Copperweld" Wire.

After an extended period of actual test service, laboratory experimentation, and field research, "Copperweld" wire is to be used as a material for residential, industrial, and institutional fences, according to the COPPERWELD STEEL CO., of Glassport, Pennsylvania, U.S.A. This new wire which may have electrical applications, is to be distributed through the Page Fence Association of Chicago. "Copperweld" wire has a thick layer of ductile copper molten welded to a steel core. The manufacturing process is as follows: After having been thoroughly cleansed and fluxed, a steel billet is centred in a mould with uniform spacing on every side; the mould is then sealed and placed in a furnace, where both are heated until the surface of the unoxidised steel reaches its melting point. Molten copper is then poured into the mould, filling the space between the white-hot billet and the inner wall of the mould. The liquid copper, coming into contact with the liquid surface of the steel, forms a continuous weld, which, it is claimed, neither bending, twisting, hot-rolling, cold-drawing, forging, nor sudden temperature changes will destroy. "Copperweld" ingot, 9 inches in diameter, is first hot-rolled into a rod ⅝ in. in diameter, after which it is cold-drawn into wire of the required size. The combination rolls and draws as one metal, the original proportion of copper and steel remaining the same through all stages of manufacture, says the *T. & T. Age*. The copper exterior affords almost indefinite life to the wire by reason of its rust-resisting qualities, and can be coloured to any desired shade of green, or brown, merely by the application of acids.

Instrument Wires.

We have received from Messrs. KENT BROS.' ELECTRIC WIRE CO., and E. H. PHILLIPS, LTD., Kew Works, Kew Gardens, Surrey, a neat little box of samples of instrument wires, representing the general manufactures of the company. The specimens are taken from the ordinary works' stock, and are intended for the scrutiny of instrument-wire buyers. The box contains eight reels, one of each of the following classes

of wire: Enamel, single and double cotton, single and double silk, and litz. In addition to the above the firm also supplies tinned-copper wires, copper aerial wires, resistance wires, flexibles, frame aerials, and so on.

A New Portable X-ray Outfit.

An interesting development in the design and construction of X-ray apparatus was demonstrated recently at the British Medical Association meeting at Cardiff. Known as the "Metalix-Portable," the new outfit, which has recently been introduced by Messrs. Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2, consists of a new type of "armoured" X-ray tube, totally enclosed in metal, to which a very high voltage is applied through the medium of two specially insulated cables. Although the apparatus operates at 65,000 volts, it is possible, it is claimed, to handle any portion of the outfit with perfect safety. A very compact "step-up" transformer is fed from an ordinary lighting circuit, and supplies the

Fig. 1.—"Metalix-Portable" Outfit, Assembled.

necessary energy to the tube. When not in use the entire apparatus, with the exception of the transformer, packs into a small suit case. As, however, the transformer weighs only 30 lb., and is provided with a carrying handle, it is readily transportable, and it is possible, therefore, for a doctor to convey the complete X-ray installation to the home of his patient. The work of erection takes only a few minutes, and it is then only necessary to press a button in order to make the exposure. It is interesting to learn that many of the competitors at the Olympic Games at Amsterdam were examined with this new apparatus, during the process of being "vetted" before the opening of the events. Fig. 1 shows the apparatus assembled ready for operation.

An Adjustable Fuse Board.

The Coolex "Adjusta" (unit-adding) fuse board, fig. 2, a production of Messrs. United Electrical Co. (Birmingham), Ltd., Coolex Works, Caroline Street, Birmingham, embodies, it is claimed, an entirely new idea of interest both to the wholesaler and to the contractor. The former will be able to reduce his stocks and yet cope with any exceptional demand, while the latter will be able to alter a stock board to suit the consumer's requirements, even though new requirements arise after the installation is completed. The bank of fuses is mounted on a slotted steel cross batten, and by slackening the nuts at the back additional ways can be added. Further, the bank of fuses can be removed and tumbler switches inserted in place thereof. As an illustration of the possibilities of this board it may be mentioned that an ordinary 6-way d.p. standard fuse board can be altered, by the aid of a screwdriver and a few spare parts, into: A 7-way d.p. fuseboard; a 2-way,

Fig. 2.—An "Adjusta" Fuse Board.

2-phase, 4-wire board; a 3-way, 2-phase, 3-wire board; a 4-way, 3-phase board; a 3-way s.p. switch and d.p. board; and a 6-way s.p. switchboard.

A Combined Fuse and Resistor.

In a recent issue of *Power* is described a combined potential-transformer fuse and resistor which has been introduced by the Westinghouse Electric & Manufacturing Co., America, for 2,500- to 25,000-V service. The unit, fig. 3, is intended for indoor application, and can be mounted on any flat surface or a 1¼-in. pipe. The resistor is placed in series with the fuse, thus limiting the short-circuit current and permitting the use of the potential-transformer fuse on any circuit. The resistor

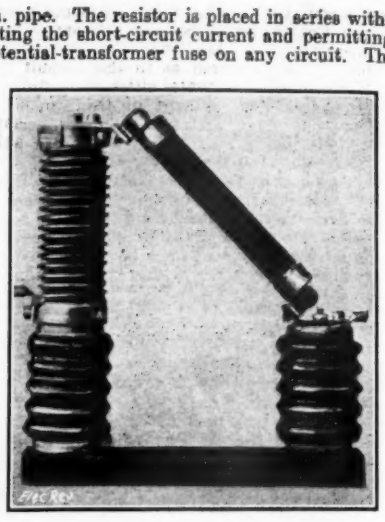


Fig. 3.—Potential-Fuse and Resistor Unit.

is made up of coiled nichrome wire wound in the grooves of a heavy porcelain tube, and may be mounted either in line with or perpendicular to the insulators, so permitting adaptation of the apparatus to space requirements.

Reviews.

R. E. Crompton—Reminiscences. Pp. xv+238; 8 plates. London: Constable & Co., Ltd. Price 14s. net.

Few books were awaited with keener interest than the autobiography of Col. R. E. Crompton, C.B., R.E., M.Inst.C.E., M.I.E.E., a pioneer in many fields, an indefatigable worker, a sailor and a soldier, an engineer and inventor, a man of many parts whose age, as reckoned in years, is great, but in terms of vigour appears to be that of a youth. To electrical men especially this volume is of interest, for it traces the history of the electricity supply industry from the very early days up to the end of the last century, a period during which the author played a leading part and exercised considerable influence on the course of events.

Born in Yorkshire on May 31st, 1845, Col. Crompton is now in his 84th year—and "still running"; from tender years he had an adventurous life, visiting Gibraltar in 1855, and the Crimea (as a naval cadet) during the war, before he went to Harrow, and he has many anecdotes to tell of those days. As a boy he was a "model engineer," and began to build a steam-driven road engine, which he completed in India, having entered the Rifle Brigade in 1864. His work on the development of mechanical road transport, advanced to a successful stage under Government auspices in India, is one of Col. Crompton's proudest memories. Returning home, he endeavoured to stimulate interest in the subject, and in 1872 resumed work in India, establishing a regular service of road trains and earning a special grant from the Government of India. In 1878 Crompton made his first electrical installation—two Gramme dynamos and Serrin arc lamps—and decided to embark on the manufacture of electrical plant. To this portion of his career four chapters are devoted; in his works a new arc lamp was developed, and, with the aid of Emil Bürgin, of Basle, a novel—and to modern minds, strange—type of dynamo was evolved (the reviewer in his 'prentice days worked on these machines, wound their quaint hexagonal core-sections, and, on occasion, short-circuited the brushes). In those days every problem was a new one, to be solved on the spot; it was a time of rich experience and technical adventure. Crompton, evolving a system of electric lighting, and Willans, turning established ideas of engine building upside-down, were looked upon as "dangerous innovators." In 1879 the former lighted his house with small arc lamps—the first instance, he believes, "of effective electric lighting of a private house"; but in 1880 he met Swan and immediately turned to incandescent lighting, undertaking numerous contracts for railway stations, &c., which necessitated the enlargement of his Chelmsford works. From that time onwards orders were abundant; designs were rapidly improved, important installations were carried out, and eventually a large contract was entrusted to "Crompton's" for the lighting of the theatres in Vienna, for the execution of which the author devised the "five-wire system" at 440 volts, using 100-volt lamps: the maximum output was no less than 1,000 kW, which made it

the largest installation in the world for some years. Of his life in Vienna, Col. Crompton has much to say; it is clear that he was something of a "lad," and was as keenly interested in the study of the Viennese as in the pursuit of electrical science. Many other Continental cities employed him as consultant, but, unfortunately, most of the contracts went to Germany, on account of the favourable terms that his competitors, supported by the German banks, were able to offer, and after 1890 he spent most of his time in England. It was in that year that Crompton read his paper before the Institution of Civil Engineers, in which he used the term "load factor," and explained the importance of improving that factor by developing the use of electricity for purposes other than lighting—pioneering indeed!

The idea of starting an electricity supply undertaking in London, with underground mains, took shape in 1886, when the "Kensington Court Company" was formed, incidentally enabling the author, who built his house "Thriplands" with a well-equipped laboratory adjoining the generating station, to conduct a vast amount of experimental work and to develop the potentiometer and other measuring instruments. There, too, the "British Standard Fine" screw thread was evolved, and much research work was done during and after the Great War. There is no question but that Crompton exercised a profound influence on the development of electricity supply on the d.c. system, with accumulators to ensure continuity of service, and he probably did more than anyone else to stimulate progress in the direction of cheapness and efficiency, by his I.E.E. papers, as well as by his practical achievements.

A chapter is devoted to the closing decade of the last century, during which Crompton's activities were at their maximum, and he himself is "astonished by the amount of business which I managed to get through and the number of places I visited"; this period includes visits to the Continent and to India, and his presidency of the Institution of Electrical Engineers in 1895-96.

In the following year he assisted Dr. John Hopkinson in the formation of a corps of electrical engineers, and he gives an interesting account of the notable part he played in the South African War, in command of the Electrical Engineers Volunteers, and a party of Royal Engineers; in that capacity he saw plenty of fighting, and saved the line of communications on a critical occasion, whilst his engineering and transport duties were multiplied amazingly. He and his men rendered excellent service to the nation in that strenuous time.

Of Col. Crompton's achievements in connection with motor transport for the Army, his contributions to automobilism (he was the first president of the Institution of Automobile Engineers), and his work as engineer to the Road Board, we can only make mention. His later years have been largely devoted to road transport, and in 1912 his connection with his Chelmsford company was severed, though he has continued to occupy the chair of the Kensington and Knightsbridge Company since 1903. He was the founder of the International Electrotechnical Commission, which first met in 1906. The last chapter records his important work in connection with the development of the "tanks" in 1914-15, and in an epilogue the author briefly surveys his life's work, winding up with the hope that the wider distribution of electrical power in this country, to which he is proud "to have contributed in some degree," will be accomplished in his life-time.

In an introduction Sir Arthur Stanley emphasises Crompton's generosity to his fellow-workers and his kindness to his subordinates. He has written a very entertaining and a very human book, full of historical information and eminently readable. Nothing in it is more striking than the long list of names of men in the front rank of electrical engineering who at one time or another were his pupils or employés, and his references to the rivalry between his d.c. system and the a.c. system of which Ferranti was the protagonist are accompanied by expressions of sincere admiration for the genius and ability of his young friend. We feel that the writing of this book increases the debt that electrical engineers owe to the author, and adds to the distinction that already attached to the name of a great electrical pioneer.

Docks, Wharves and Piers. By F. M. DU-PLAT-TAYLOR, M.Inst.C.E. Pp. xxvii+495; figs. 454. London: Ernest Benn, Ltd. Price 70s. net.

A perusal of this book shows that there is little to criticise, but in the following, when, in our opinion, the text calls for it, criticism will be made in the form of what we hope will be regarded as helpful suggestions for the improvement of a work which, deservedly, is likely to become a standard work of reference.

As it is not our intention to review the book chapter by chapter, it may be stated that the work can be divided broadly into nine sections. We consider that the first of these, a chapter on Organisation and Management, is too short. Considerations of space probably account for the brevity.

Of particular interest are charts showing the organisation of one of our principal ports before and after 1924. As far as can be ascertained the reorganisation in 1924, which is said to have been part of an "economy" campaign, resulted in the abolition of the post of chief engineer and other radical alterations in the engineering department. Like the author, we wonder whether any real economy has resulted from the reorganisation.

Forms of Accommodation, which constitute the second section of the book, are dealt with in two well-written chapters. The author rightly gives prominence to a definition of "cargo-density" proposed some years ago by Mr. H. J. Deane. The law of cargo density is one of the principal factors governing the handling and storing facilities which have to be provided.

The third and fourth sections of the book are devoted to quay walls, jetties, dry and floating docks, and lock entrances and gates. In our opinion a rare opportunity was missed in failing to describe the ports and docks on the Great Lakes-St. Lawrence Waterway. It is not generally known that, both as regards size and traffic, some of these ports are comparable to the world's largest ports, and the facilities for bulk handling make ridiculous the "facilities" provided elsewhere.

Dock and Wharf Buildings are treated in the fifth section. It is common knowledge that cargo and general merchandise cannot be handled economically in warehouses of six or more storeys. The single-storey shed is the ideal form, but, as ideals are usually expensive, the two-storey construction has often to be adopted as a compromise.

He would be a very difficult man to please who failed to find much to interest him in Sections I to V, into which we have classified the chapters, and this applies equally to the group of chapters on Fittings, Equipment and Machinery, which we will call Section VI. In the next edition we suggest that the author should give the post-war cost of pressure water with highly-efficient electrically-driven plant. Our old friend "Eight pence per 1,000 gallons at 800 lb. per sq. in. with a normally efficient plant" of pre-war days gave rise to unprofitable discussion extending over a decade, during which some of the hydraulic crane makers went out of business, while the makers of electric cranes worked overtime.

We also consider that reasons should be given for the statement that "for dock machinery direct current is the most satisfactory." We believe that a combined a.c. and d.c. system is preferable, and we know that an a.c. system is decidedly superior in certain cases. With the advent of the super-power station in this country it should be possible to use large squirrel-cage induction motors with condensers for power-factor improvement, such as are in use at other ports, and these will make less arduous the work of the electrical engineer who, under present conditions, is truly "'twixt the devil and the deep sea."

While the hydraulic system may be "undoubtedly superior" for operating lock gate machinery, the fact cannot be ignored that many large locks are electrically operated, and we consider that brief reference should have been made to these.

The author's attention is directed to a number of errors and omissions in the seventh section, which deals with Conveying and Elevating Machinery. It is not correct to state that since 1897 pneumatic elevating plant has been introduced in almost all parts of the world where grain is handled. Actually such plant has a strictly limited sphere of usefulness. As far as ports are concerned the pneumatic system is a convenient one to adopt for *discharging* grain from the vessels, particularly when the cargo consists of a large number of relatively small parcels. In such cases there are objections to using the bucket elevator, or "marine leg," as it is called, but at some ports there are marine legs, each having an hourly discharging capacity of 660 tons of wheat. When conditions are favourable the power cost may be only 20 per cent. of that required by the pneumatic system. There are few more impressive sights in the bulk handling of material than that of three marine legs working simultaneously on a cargo and discharging 2,000 tons per hour, with the mechanical shovels operating in the holds to feed the legs. At the port of Rotterdam there are probably more floating pneumatic elevators at work than in the whole of Great Britain. As many as four such elevators may work simultaneously on a cargo, but the total output is much less than that of a single marine leg worked under normal conditions.

In the countries where grain is "handled" the capacity of the belt conveyors is no less than 2.2 times that given by the author, and a typical bucket elevator, or "leg," lifts wheat at the rate of 500 to 650 tons per hour to a height of 220 ft. or more with a power consumption of little more than one-fifth of a unit per ton. For the driving of such machinery electrical energy is indispensable.

As Great Britain is the premier grain-importing country, it is extraordinary that the facilities provided for handling and storing grain should be so notoriously insufficient and inefficient. The number of modern grain silos at our ports can be counted on the fingers of one hand, and the discharging appliances are totally inadequate.

The chapter on Dredging (Section VIII) is followed by a group of three chapters on Construction and two on Maintenance. Like the rest of the book, they bear traces of much labour and research, and are particularly well written.

Five appendices, together with as full an index as one could wish for, bring the book to a close.

Apart from the large amount of authoritative matter compressed into its 500 pages, the enormous labour entailed in its compilation is one of the outstanding features of the book, which we consider to be moderately priced at 70s. In complimenting the author on his book, the success of which we believe to be assured, we consider that a word of praise is due to the publisher and printer.

H. H. BROUGHTON.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

Two Interesting New Valves.

The screen-grid h.f. amplifying valve, "Osram" S.625, has proved to be capable of much that was claimed for it; now there has come a demand for a similar type to be used with 2-volt accumulators, to meet which the General Electric Co., Ltd., will put a new "Osram" S.215 on the market in September. Its construction and appearance differ from those of the 6-volt type, for it is fitted with a standard 4-pin cap and a small terminal on the top of the glass bulb. It will be remembered that the S.625 has the control-grid and filament pins at one end of the valve, and the screen grid and anode pins at the other; an equivalent design has not been found practicable for the 2-volt valve, but, none the less, the anode is at the remote end from the grid, so reducing self-capacity to a minimum, whilst allowing good screening to be effected between the grid and anode. The screen grid itself is connected to what is usually the anode pin on the base, and the extra grid forms a complete electrostatic screen, which is built up close to the glass bulb inside, and can be extended to the outside of the valve by means of the screen in the set in a similar manner to that employed for the S.625. This form of construction improves the "mutual conductance" of the new valve, so increasing the amount of h.f. amplification possible. It must be pointed out, however, that if "feed-back" and self-oscillation are to be avoided, it is necessary to have more careful screening; it must be emphasised, too, that if it is desired to employ two stages of h.f. amplification, using this type of valve, care must be taken with the screening arrangements if instability is to be avoided. The bulb diameter at the screen is the same as with the S.625, which obviates the necessity for any alteration in screen fittings when changing from 6- to 2-volt valves. Fig. 1 shows how the new valve may be connected; its filament takes 0.15 amp. at 2 volts.

A screening grid affords such an opportunity for increasing the amplification factor, whilst at the same time retaining high "mutual conductance," that it has stimulated the production of a similar type for use on the l.f. side of the receiver. In this case the requirements are a large current fluctuation output, and capability of standing a reasonable input to the grid; the reduction of self-capacity is not so important as in the case of the h.f. valve. Such a "Pentode" valve will shortly be marketed by the General Electric Co. The introduction of a third grid between the screen grid and the anode has the effect of greatly increasing the working range of undistorted output. The anode connection is joined to the anode pin in a four-pin base in the usual manner; the screen grid is connected to a small terminal on the side of the base, and the additional grid (which is introduced purely for changing the h.f. screen-grid valve into the l.f. amplifying valve) is joined internally to the filament. The introduction of an "Osram Pentode 235" into any set consequently merely requires it to be plugged into the socket of the last valve with a separate lead between the small terminal on the base and the positive of the h.t. battery. Great care must be taken that the input to the valve does not exceed its available grid swing, which is about the same as that of an "Osram" D.E.P. 215. It consumes 0.35 ampere at 2 volts, and under normal conditions the anode current is about 10 milliamperes. Fig. 2 is a circuit showing how the "Pentode" can be connected as an amplifier.

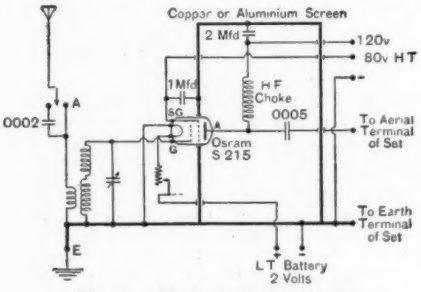


Fig. 1.—Method of Connecting "Osram" S.215 Valve.

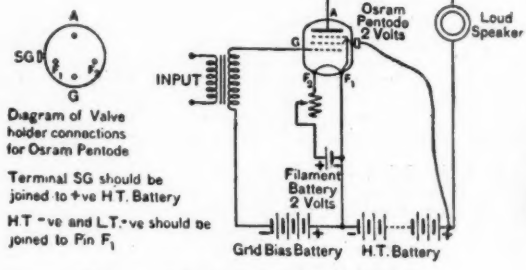


Fig. 2.—"Pentode" Valve Amplifier.

Fig. 3.—New Weston Voltmeter.

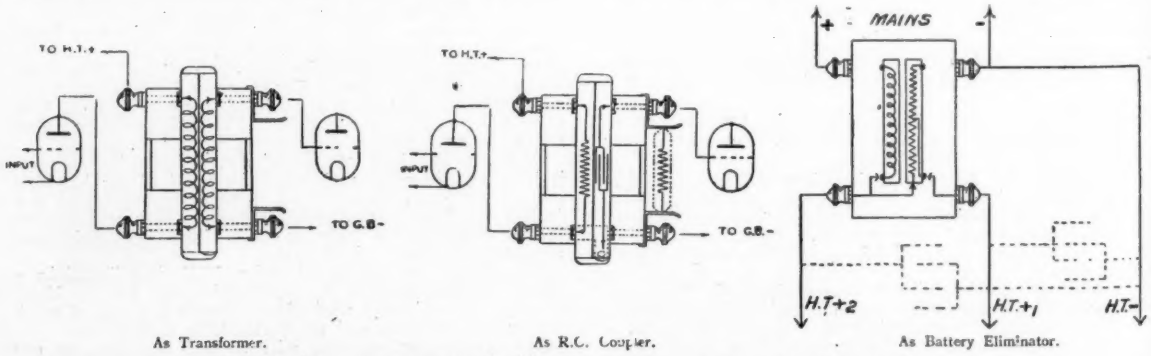
Portable Measuring Instruments.

Whilst the new models of its portable, pocket size, a.c. and d.c. testing instruments have been developed by the Weston Electrical Instrument Co., Ltd., primarily for radio service, there are many other uses for which they are well suited. The d.c. Model 489 voltmeters (fig. 3) are permanent-magnet pivoted moving-coil instruments, with a double range, and are made with two sensitivities: 125 ohms per volt for general service (150 and 7.5 V, or 200 and 8 V), and 1,000 ohms per volt for checking the output of battery eliminators (200 and 8 V, or 250 and 50 V). All standard ranges have self-contained resistances, and their light weight and the low moment of inertia of the moving coil ensure good damping and long life.

The Model 528 ammeters and voltmeters for a.c. are also suitable for d.c. circuits. A feature of these high-grade instruments is their sensitivity, namely, 6 mA at 600 V; they are multi-range and available for all commercial frequencies.

The "Ampliformer."

A really versatile radio component has been placed on the market by "K.N." Electrical Products, Ltd., which should help to satisfy individual taste, for it permits the user to choose his own values, or, alternatively, to adhere accurately to recommended values, instead of being limited to the acceptance of the respective manufacturers' designs. The device (fig. 7) is quite simple: embedded in the moulded insulating base is a laminated-iron carcase, in the central slot between the two limbs of which fit tightly two bobbins provided with studs which make automatic contact with spring clips on the base, so that they cannot be inserted the wrong way round. Each bobbin is a circular flat disk made of moulded insulating material, into which is pressed the winding in wax; through the centre of each is a square hole for the insertion of a packet of laminations to complete the iron circuit of the base. It will thus be apparent that any desired combination may be easily



As Transformer. As R.C. Coupler. As Battery Eliminator.

Figs. 4, 5 and 6.—Suggested Applications of the "Ampliformer."

obtained by simply withdrawing the bobbins and inserting another pair of different primary or secondary (or both) values. It can be employed in many capacities without, in many cases, involving re-arrangement of the permanent wiring, or reconstruction of the circuit; for instance, it will perform the functions of all the undermentioned components:—(*a*) L.f. transformer (fig. 4) permitting also "capacity phase reversal" and any form of inter-valve coupling without rewiring, straightforward interchangeability enabling the unskilled user to vary the performance of his set as regards tone and volume in a simple manner; (*b*) i.f. transformer; (*c*) push-pull transformer; (*d*) output transformer; (*e*) l.f. choke; (*f*) choke-capacity coupler; (*g*) resistance-capacity coupler (fig. 5), which can also be used with a "choke leak" compactly; (*h*) anode battery eliminator for d.c. mains (fig. 6), enabling the elements to be chosen to suit the demands of the set and the peculiarities of the mains off which it has to work, and permitting the user to change from the potentiometer to series form of

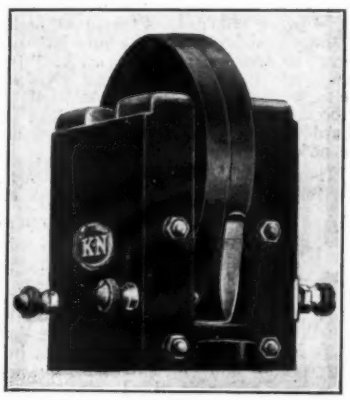


Fig. 7.—The "Ampliformer."

elimination without rewiring. The "Ampliformer" should, of course, be mounted in an accessible position in order that the bobbins may be easily interchanged; the component (British patent 289,566) should be of value to experimenters particularly, to whom other uses will suggest themselves.

Correspondence.

***Correspondents should forward their communications as early as possible.** No letter can be published unless we have the writer's name and address in our possession.*

Pure Food.

Recent reports of illnesses and deaths arising from the consumption of contaminated food appear to have had the unfortunate effect of inspiring misguided advocacy against the greatest pure food reform ever adopted in this country.

The "Public Health (Preservative and Colouring Matter in Food) Regulations, 1925," were actually long overdue; our regulations are certainly not more stringent than those which have been in successful operation in America for a long time. America keeps healthy without introducing chemical preservatives into food simply because she is more advanced with regard to refrigeration.

I submit that there is no logical reason for suggesting a return to dangerous chemical preservatives, but that ample provision should be made forthwith for refrigeration, which is the only certain means of ensuring pure food.

V. W. Dale,

The British Electrical Development Association, Inc.

London, *August 21st*, 1928.

Engineering Mathematics.

In your article on the "Teaching of Engineering Mathematics," the author refers to the difficulties of the mathematical teachers and the discouragements of students. The same day that I read the article I came across a young engineer who had just failed to get his ticket on account of coming a cropper on "maths," and he incidentally mentioned that his mathematical teacher did not take any pains to help his students. During the war when the American battleships were being fitted up with the electric drive, I began to make a study of the problems connected with the induction motors used on the battleships, of 7,000-8,000 h.p.; the motors which were being designed for the cruisers were to be of 22,000 h.p., the total s.h.p. of each being 180,000 h.p. Lack of knowledge of mathematics and the working-out of circle diagrams was a great drawback to my studies.

I tried to get information from the young engineers and electricians with whom I was working, who had been trained in the technical schools and universities, and I was surprised at their lack of knowledge, particularly of the working-out of the circle diagram. For the last forty years or so I have found no difficulty in dealing with direct-current problems, but with the increased use of the alternating current, especially when dealing with the induction motor, a thorough knowledge of mathematics and the use of vector and circle diagrams is absolutely necessary. I wish to make an appeal to the mathematical teachers to deal gently with their less fortunate brethren, and to do all they can to help their fellow-men, especially those like myself who have not had the opportunities that the younger generation have to-day.

Charles Rettie.

Liverpool, *August 22nd*, 1928.

An Engineer's Reading.

Surely Kipling's masterpiece—from the marine engineer's point of view—is "The Devil and the Deep Sea," in "The Day's Work," when there are no facilities for even the smallest repairs.

L. J. Jenkins.

Bristol, *August 16th*, 1928.

Shoddy Wiring.

I have read in the "Correspondence" columns of your issue of the 24th inst. the communication signed "N.R.E.I.C.," a somewhat misleading *nom de plume*. The identity of your correspondents is quite clear to me, and I must ask you to afford equal publicity to the "other side" so far as it affects the reference to their letters being characterised as impertinent.

I will quote the first two paragraphs of your correspondents' last letter to me, and the first paragraph of my reply:—

"We are in receipt of your letter of 3rd instant in answer to yours of the 2nd. We would like to inform you that in our opinion, your letter is entirely biased in favour of the firm mentioned by us.

"We would like to know the names of the people who constitute the Local Advisory Committee, for, as *members* (*sic*) of some years standing, it is our duty at least to uphold the standard of membership as far as possible. It appears to us that at the present time the main object of the N.R.E.I.C. consists of enrolling members at any cost."

My reply was as follows:—

"I am in receipt of your letter of the 4th instant. The remarks in the first paragraph are quite unjustified, and in the second paragraph are both untrue and impertinent."

I then detailed the information they desired, having in my previous letter explained the position in regard to applicants for registration who carried on the businesses of plumbers and electrical installation contractors.

So offensive and untrue a charge against the representative body of gentlemen comprising the Executive Committee who voluntarily expend so much time and trouble on their duties, might well be characterised by a stronger word than "impertinent."

I may add that the application for registration of the firm to which "N.R.E.I.C." refers will come before my Executive Committee for decision at their next meeting.

T. Trimnell

(*For the* National Register of Electrical Installation Contractors.)

London, *August 24th*, 1928.

Past and Present Conditions of Jointing.

Re "Plumber-Jointer's" letter in your issue of the 17th inst. I am sure, should "P.J." take the trouble to refer to his first article he will not fail to note that he deals with what has happened in various undertakings with which he has had employment; also what has happened in the "guid auld" days. How we all sigh to strike them once again. Incidentally this raises what "P.J." terms a subject of controversy over ability, proficiency, &c. How can it give rise to any other reasoning? He undertakes to speak for the jointing industry in general when he uses such expressions as "we" and "the considered opinions of many." If "P.J.'s" remarks are sifted regarding agitation, one can only presume that he and such as he are a drag to humanity. Agitation and healthy criticism, I would remind him, are spurs to progress. Were we able to follow "P.J.'s" reasoning we would still be wearing loin cloths. "P.J." has misconstrued my remarks regarding the Southern Hemisphere. I made no reference to the question of remuneration paid, but to licences, as a proof of competence, for electrical workers (not mains engineers or officials).

I quite realise some men, irrespective of occupation, require constant supervision and instructions. Skilled craftsmen (and I have met a few) usually are sufficiently skilled and capable of taking the initiative; they work without supervision, carrying a job through from start to finish. As to 3-yard services on change-overs in industrial areas, they can be more than frequent. This I am quite aware of. I mentioned modern building construction, particularly in residential areas. I am sure you would not lose sight of this.

Cairngorm.

August 20th, 1928.

Electric Heat in the Garden.

As both a gardener and an electrical engineer, I have read with interest the article by Mr. R. Borlase Matthews in your issue of August 10th, but must confess that I am puzzled by the title. Why "Electric Heat"? Has "electric" heat some virtue not possessed by other forms of heat?

In this country the bulk of the electrical energy is generated in steam stations, and it is well known that the overall efficiency from the heat units in the fuel to the heat equivalent of the electrical energy delivered to our houses does not exceed as a rule 10 per cent. With such a low efficiency, electric heat compares very badly with other methods of heating, depending on the combustion of solid, liquid, or gaseous fuels. Efficiencies of 50 per cent. or 60 per cent. can easily be obtained with hot-water boilers, whether heated by coke, oil, or gas. From the point of view, therefore, of national economy of fuel, it is not justifiable, nor is it sound engineering practice to use electric heat except in special cases where it has some outstanding advantage over other methods of heating. To give an example, it is justified in an electric furnace or a baking oven, owing to the possibility of reducing the heat losses far below those of a combustion furnace.

Is the use of electric heat in the garden or nursery justified in this country?

Several of the examples which Mr. Matthews quotes are in Norway or Sweden. Obviously there is a good case in those countries where the electricity is as a rule generated by means of water power, and where fuel is scarce and costly.

I gather from Mr. Matthews's article that he is advocating electric heating on a large scale in nurseries. Would he suggest that with electricity obtained from a steam station it is possible for electric heat to compete in cost with heat obtained by the combustion of coke or residual oil and distributed in the form of hot water? Thermostats are applied to the temperature control of hot-water systems, and with a properly designed system there is no difficulty in working within the necessary temperature limits.

A means by which the electricity supply engineer could co-operate effectively with the market gardener has been suggested by Mr. H. M. Sayers. He proposes to use the heat units in the cooling water from steam generating stations to warm the soil, and this proposal appears to me to deserve the consideration of the Electricity Commissioners. The temperature which Mr. Matthews gives as necessary for the stimulation of plant growth is 75 deg. F., and as the temperature of the circulating water from the condensers is round about 90 deg. F., there appears to be no reason why some attempt should not be made in this way to turn to some useful purpose the enormous quantity of waste heat from our steam stations. Many of the new generating stations are situated in outlying districts where land is available for intensive cultivation.

Recently it has become evident that at present the large generating stations are injuring rather than helping the people who are attempting to grow crops, and this would appear to be an opportunity for electricity supply undertakings to show that they are capable of doing the market gardener a good turn as well as a bad one.

F. J. Moffett.

Birmingham, *August 20th*, 1928.

Overhead Lines.

In the *Morning Post* this morning I have just come on the following, from the memories of an old reader, revived by a visit to the Gloucestershire village where he was born:—

"Also I recall the anger of the inhabitants when telegraph poles were put up on the village green. . . . The disfigurement of the green is long forgotten, and there are now seven motor omnibuses a day to Gloucester."

Again history repeats itself. We have in this country to-day no lack of people who will undoubtedly continue to make a tremendous fuss about overhead lines generally, and the Central Board's lattice towers in particular.

It is pleasantly amusing to reflect that long after they and the rest of us have been forgotten, those towers will probably continue to carry out their useful functions, and that possibly some "old reader" will "recall the anger," &c., in the year 2028.

It is also encouraging to remember that, as in the past, so in the present and future, the work will go on in spite of the anger and wrong-headed objections of those who, seeing only the trees (certainly the poles!), never perceive the woods. "Bona si sua norint!"

G. Molle, A.M.I.E.E.

London, *August 21st*, 1928.

Does It Pay to Acquire Knowledge?

I have much sympathy with the aspirations of your recent correspondents on the subject of "Does it Pay to Acquire Knowledge?" and though I have as yet no long experience I should like to offer my advice for what it is worth.

I am about the lowest paid member of the technical staff of my firm and at the same time the only man with a degree, yet my answer to the question is an emphatic affirmative.

The acquirement of any sort of useful knowledge is a satisfying occupation in itself and it broadens and develops the mind, enabling one to face the inequalities of this world with a certain amount of philosophic calm.

Leaving out the rather sinister factor known as "influence," the material rewards that will follow the acquirement of qualifications depend on the use one makes of them and the commercial ability displayed in selling one's services in the best market.

If a man improves himself and has the opportunity to make use of his acquired knowledge on behalf of his firm, it will then be to the advantage of his employers to increase his remuneration in order to retain his services; on the other hand the acquirement of academic distinction alone, of which no use is made, is of little advantage to the employer looking for results, and the reward will be limited to the satisfaction that comes from knowing things.

The obtaining of a degree certainly qualifies one for Government posts, yet I am afraid that men who have had enough grit to study hard in their spare time and naturally want to make use of their knowledge would often feel themselves rather cramped by the nature of their employment.

As regards the teaching, advertisements generally specify technical training, thorough works and teaching experience as essential qualifications. Bearing in mind the fact that a little war occurred a few years ago, in which quite a lot of us now aged about 30 were engaged, it seems that anyone who possesses all these qualifications must have left school at quite a tender age. The question seems to arise: "How do technical teachers obtain their first teaching post, if at all?"

Seeing the fortunes made by funny men on the films and by other queer occupations, it is only natural that people should wonder if hard study were worth while; yet on the whole there can be no doubt that it is, for

"'Tis not in mortals to command success
But we'll do more . . . deserve it."

"Palmam qui meruit ferat."

August 22nd, 1928.

"Ambitious" has got into a *cul-de-sac*. He should cut adrift entirely. Acquiring knowledge is essential, but it does not constitute the whole of life. The using of that knowledge when acquired is four-fifths or more. While he has shown excellent perseverance and determination, he seems to have failed in the business of selling his knowledge.

He should beg, borrow, or save up enough to take him out to one of the Colonies and to keep him for the first few weeks after his arrival. He should take the first billet offered, whether in his line or not, and work at it while looking round, and better himself as opportunity offered.

I know, because I have lived in a Colony for over thirty years and am now independent, a state which I should never have reached in England.

Sympathy.

August 20th, 1928.

Having read the remarks of "Aged 36" upon progress and promotion in the electrical industries, I should like to give you my opinion on this subject.

Though I have been in business for only a few years, I have noticed time after time the poor system of promotion which exists in the business houses. It seems that promotion is mainly based upon the length of time you have served with your employer, and the retirement of those above you. Many young men who spend their evenings in night school are never sure that they will ultimately profit by their labours. The way to success is mainly by the way of knowledge—not plain theory, but to apply your knowledge in the correct manner. Unfortunately, the opportunities to do this are very rare, and therefore your knowledge is not appreciated.

If every young man was given his chance and every young mind encouraged, the capable would be in their proper places, controlling, whilst the incapable would have to follow. If this was the case, would not our industries thrive and absorb the unemployed, instead of keeping in the rut?

Everybody has a dormant purpose, and it is up to the employer to take interest in those who take interest in him.

Young Man.

August 25th, 1928.

Radio Valve-Anode Capacitive Resistance.

I am pleased to see that Mr. Owen Harries has written concerning what appears to be clearly a fundamental error on the part of Mr. Braendle in his article headed as above in your issue of August 10th.

Being much interested in this matter, I should have liked to give my view of Mr. Braendle's error somewhat in detail. Time, however, being rather limited just at present, may I offer the following basic remarks for Mr. Braendle's consideration:—

(1) In so far as the family of anode current-grid potential characteristic curves of a valve are straight and parallel and proportionally spaced, *i.e.*, in so far as ordinary rectification does not take place, it is a straightforward and definite mathematical result that the equivalent a.c. circuit is as in fig. 1 of Mr. Harries's letter.

(2) It is, as pointed out by Mr. Harries, the slope resistance, and not the whole resistance of a valve, which enters into the a.c. circuit considerations, and these are constant if the premises in (1) are true.

(3) For a sinusoidal variation of grid potential the whole resistance varies periodically (but not simply sinusoidally). A periodic variation of resistance in an a.c. circuit, of identical

frequency to its own, would in general cause rectification, but in this instance the variation is automatically in such a phase as to cause none.

(4) The fundamental necessity of rectification by purely electrical means is a conductor whose static volt-ampere characteristic is not straight. It may be mathematically proved that rectification cannot be produced by any combination of straight-characteristic resistances and condensers subject to an a.c. voltage (defined as below).

(5) In view of Mr. Harries's remarks it is interesting to note that, if we define an a.c. voltage, as I think we should do, as one of equal positive and negative electrical impulse (time integral of voltage), transients which may be considered to satisfy this definition would not cause rectification.

(6) In order that a valve shall satisfy the linearity requirement of a non-rectifying resistance, not only its grid conductance, but also its anode conductance, must be constant in the region utilised. Some degree of rectification is therefore almost always present, and, personally, I suggest this as the sought-for explanation of Mr. Braendle's observations.

B.Sc., A.M.I.E.E.

August 22nd, 1928.

With reference to the recent correspondence upon the subject of a.c. anode resistance in valves, I should like to point out that the resistance, anode-filament, is dependent upon the space charge, which is directly affected by the grid voltage: since this modifies the potential gradient across the space.

In making calculations, what is generally required is the varying component of the plate current.

$$dI_p = M\,dV_g$$

where M = mutual conductance.

The a.c. anode resistance cannot be incorporated in calculations, since it is not a fixed quantity. Similarly the "amplification factor" of the valve alone is a purely imaginary quantity, the total amplification being dependent upon the impedance in the anode circuit.

Under certain conditions the effect of varying the grid volts may be the same as that of injecting an e.m.f. into the anode circuit, but it cannot be argued that the anode resistance is constant.

As Mr. Harries points out, the *effect* of a sine wave is the same whether the resistance or the injected e.m.f. is considered to vary. But surely the point is the relative value of dI_a in terms of fixed quantities: mutual conductance, grid volts, anode volts, instead of in terms of varying or imaginary quantities such as anode impedance "amplification factor."

Examining the matter from the mutual conductance point of view:—

Let anode current I_a flow at plate volts V_p and grid volts V_g.
Let M = mutual conductance.

Impedance $= V_p/I_a$ at V_g.
Let grid volts increase to $V_g + dV_g$
Then I_a becomes $= I_a + M dV_g$
Impedance $= V_p/(I_a + M dV_g)$ at $V_g + dV_g$.
Now add resistance R in anode circuit.
Total impedance at grid volts $V_g = V_p/I_a + R$,
anode current $= V_p/(V_p/I_a + R)$.
Total impedance at grid volts $V_g + dV_g = V_p/(I_a + M dV_g) + R$,

$$\text{anode current} = V_p \Big/ \left(\frac{V_p}{I_a + M dV_g} + R\right).$$

Change in anode current $dI_a =$

$$V_p\left[\,1/(V_p/I_a + R) - 1/(V_p/(I_a + M dV_g) + R)\right].$$

Since V_p is present alone in the numerator and is accompanied with other quantities in the denominator output voltage E is dependent upon anode volts

$$E = R \times dI_a = RV_p\left[\frac{1}{V_p/I_a + R} - \frac{1}{V_p/(I_a + M dV_g)} + R\right].$$

According to "elementary valve theory"

$$E = \mu dV_g \times R/(R + R_a) \text{ where } R_a = \text{anode impedance}$$

This is clearly incorrect from the foregoing.

In conclusion I should like to say that I have never seen the grid voltage stated by manufacturers when giving anode impedance figures.

H. H. Ryder.

Harrow, *August 24th*, 1928.

Lamp Discounts.

Quite recently the wireless trade was notified of a ramp on the part of the B.R.V.M.A., the discounts to exclusive sellers being reduced from 25 per cent. and 5 per cent. to 25 per cent. After tieing traders down for twelve months to selling "Ring" valves by offering a special discount, and *thus getting the market*, they reciprocated by reducing the trader's profits.

The same thing is now being tried on by the E.L.M.A., and I, for one, consider it is time the retailer made a stand.

There are two alternatives open to us: to stock and sell as many non-ring lamps as possible, *or* to continue buying ring lamps but *stop purchasing any other materials or goods whatever from members of the ring*. If traders will do this the members of the E.L.M.A. will perhaps study their customers more. Lamps are not the only things we buy.

C. Culmer Hodges.

Dawlish, *August 27th*, 1928.

Several letters have been unavoidably held over.—EDS., ELEC. REV.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1927.

2,755. "Wireless telegraphic and telephonic devices." L. L. K. Honeyball. January 31st, 1927. (294,946.)

8,004. "Sound reproducer, such as a loud-speaker." H. N. Wilson January 23rd, 1928. (295,057.)

8,742. "Electric discharge devices." British Thomson-Houston Co., Ltd. April 9th, 1926. (269,161.)

8,874. "Electric alternating-current single-phase apparatus, meters, and relays of the moving-iron and moving-coil types." C. L. Lipman. March 31st, 1927. (294,919.)

9,045. "Mercury-vapour arc lamps." F. W. Gillard and D. L. West. April 1st, 1927. (Cognate application, 70/28.) (294,949.)

11,788. "Electric synchronising apparatus." A. Reyrolle & Co., Ltd., and T. R. Warren. May 3rd, 1927. (294,970.)

11,789. "Electric synchronising apparatus." A. Reyrolle & Co., Ltd., T. R. Warren, and N. Cooke. May 3rd, 1927. (Cognate application, 25,955/27.) (294,971.)

11,863. "Electron-discharge devices." Standard Telephones & Cables, Ltd., and W. T. Gibson. May 3rd, 1927. (Addition to 240,629.) (294,974.)

11,869. "Signalling systems." Electrical Research Products, Inc. May 3rd, 1926. (270,354.)

12,663. "Alternating electric current phase-converters." E. Schroder May 11th, 1927. (295,068.)

12,889. "Gasfilled electric lamps." Siemens Electric Lamps & Supplies, Ltd. (formerly Siemens & English Electric Lamp Co., Ltd.), and P. D. Oakley. May 13th, 1927. (295,072.)

13,532. "Thermionic valves." British Thomson-Houston Co., Ltd., T. H. Kinman, and L. J. Davies. May 19th, 1927. (295,079.)

13,707. "Mounting of piezo-electric crystals." H. J. Lucas. May 21st, 1927. (295,081.)

14,490. "Switchgear." A. F. Harmer and Metropolitan-Vickers Electrical Co., Ltd. May 30th, 1927. (295,091.)

15,098. "Masts used in the transmission of high-tension electric currents." F. Berg. June 7th, 1927. (295,095.)

15,401. "Electric lighting systems and apparatus." M-L. Magneto Syndicate, Ltd., and E. A. Watson. June 9th, 1927. (295,097.)

17,112. "Sound-waves receivers." Dr. W. Kuhnert and Dr. M. Maurer. July 9th, 1926. (274,067.)

17,863. "Apparatus for radio-telegraphy or telephony." Soc. Anon. des Etablissements Herbelot & Vorms. July 5th, 1926. (273,773.)

21,360. "Heat-sensitive recording papers and the like suitable for use in picture and the like telegraphy." Marconi's Wireless Telegraph Co., Ltd. August 14th, 1926. (276,020.)

21,898. "Electromagnetic relays." H. Stavostrand. August 19th, 1927. (Convention date not granted.) (276,354.)

25,859. "Electro-mechanical device for locking, from a distance, a movable member in a definit position." Compagnie pour la Fabrication des Compteurs et Materiel d'Usines a Gaz and Action a Distance. October 13th, 1926. (279,063.)

27,550. "Connection for feeding watt-metrical relays adapted to protect electric mains." Unior d'Electricité. June 3rd, 1927. (291,418.)

27,777. "Electric photo-telegraphic and television systems." British Thomson-Houston Co., Ltd. October 19th, 1926. (279,457.)

28,924. "Connection of electrical cables of flexible conductors to certain kinds of switches, bell-pushes, ceiling-roses, lampholders, and the like." J. A. Crabtree. October 31st, 1927 (295,149.)

29,751. "Method for producing metals from their sulphides in electric furnaces." E. G. T. Gustafsson. November 11th, 1926. (280,540.)

29,946. "Electric cable." Soc. Electro-Cable. November 23rd, 1926. (281,255.)

31,049. "Electric resistance heating apparatus." B. Chiaberge and O. Biglia. November 18th, 1927. (295,159.)

32,132. "Electric power systems." C. Meyer. November 29th, 1927. (Addition to 208,487.) (295,162.)

1928.

2,814. "Manufacture of accumulator plates." I. G. Farbenindustrie Akt.-Ges. January 28th, 1927. (284,355.)

4,060. "Electric driving device for talking machines." W. De Wrangel. August 18th, 1927. (295,189.)

4,413. "Thermionic amplifiers." F. A. M. Christensen. February 11th, 1926. (295,191.)

4,917. "Electric incandescent lamp with an incandescent body of tantalum carbide." B. Erber. March 9th, 1927. (286,687.)

5,072. "Electric current rectification." L. St. C. Broughall. February 17th, 1928. (295,194.)

7,386. "Safety or protective devices for electrical apparatus." British Thomson-Houston Co. Ltd. March 18th, 1927. (287,170.)

7,712. "Electric heating resistances." F. W. Tabb. March 18th, 1927. (287,173.)

9,311. "Electric insulators with conductive condenser inlays." A. Imhof and Micafil Akt.-Ges. May 4th, 1927. (289,850.)

10,376. "Combined electric switches and lampholders." International General Electric Co., Inc. April 19th, 1927. (289,006.)

11,019. "Television and like systems." Television, Ltd., and J. L. Baird. August 9th, 1927. (Divided application on 289,307.) (295,210.)

12,258. "Picture telegraph, television, and the like receiving apparatus." Telefunken Ges. für Drahtlose Telegraphie. June 10th, 1927. (291,786.)

14,023. "Vacuum tube electric devices." Westinghouse Electric and Manufacturing Co. May 12th, 1927 (290,301.)

16,475. "Mercury-vapour rectifiers." Akt.-Ges. Brown, Boveri et Cie. June 20th, 1927. (292,500.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 22nd:—

Panamplus. No. 492,396. Class 8. Instruments and apparatus for use in radio-telephony and telegraphy.—Universal and General Radio Co., Ltd., 42a Bravington Road, W.9.

Radcrotx. No. 492,583. Class 8. Sound amplifying apparatus for use in connection with radio-telephonic apparatus.—L. S. Alexander, trading as the Wholesale Wireless Co., 103, Farringdon Road, E.C.1.

Kuyrode. No. 492,317. Class 11. High-frequency electrodes made specially for therapeutic purposes.—Kelvin, Bottomley & Baird, Ltd., 16-20, Cambridge Street, Glasgow.

Veeta. No. 492,151. Class 13. Electric switches.—General Accessories Co., Ltd., 18-22, Euston Buildings, Euston Square, N.W.1.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALEXANDRIA (Dumbarton).—School; clerk, Vale of Leven School Management Committee.

AYR.—Telephone exchange; architects, H.M. Office of Works, 122, George Street, Edinburgh.

BATTLE.—Sunlight clinic for the Board of Guardians; A. J. Jenner, architect, Linton House.

BOURNEMOUTH.—Block of flats, Kimberley Road; G. Pearce. Alterations, Hastings House, Alumhurst Road; Eldridge Pope & Co. Flats, garages, &c., Boscombe Grove Road; Grounds & Newton. Hall, Lincoln Avenue; E. G. Stay. Block of shops and flats, Holdenhurst Road; A. Gould. Seven shops and houses, Charminster Avenue; S. G. Ward.

CANTERBURY.—Highways depôt; Kent county engineer.

CARSHALTON.—Eight shops, Rosehill; R. A. Reed.

CHINGFORD.—Extensions, South Chingford school (£15,000); Essex County architect.

COLCHESTER.—Adaptation of East Hill House as secondary school; Essex County architect.

COLEFORD.—Secondary school for Gloucestershire E.C.; T. E. Gordon, clerk, Gloucester.

CRADLEY HEATH.—Employment exchange, for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

DEAL.—Housing scheme (50), for the Snowdown & Bettes-hanger Tenants, Ltd., 19, Victoria Street, Westminster.

DUNDEE.—Cinema, Forest Park Road; C. Gray, builder, Canning Street.

EAST SUFFOLK.—Police houses at Pettistree, Yoxford, Sutton and Yaxley; Standing Joint Committee.

EDINBURGH.—Telephone exchange, Denham Green Terrace; architect, H.M. Office of Works. Lecture theatre at Jordanburn Nerve Hospital; medical superintendent.

FOLESHILL (Coventry).—Re-erection of saw mills (electrically equipped), for Kelley & Son (£5,000).

GLASGOW.—Episcopal Church at Riddrie; Rev. Dr. Reid, Bishop of Glasgow. High School, Hillhead; director of education, 129, Bath Street. 510 houses, Scotstoun; housing director and trade contractors. 852 houses, Knightswood; housing director and trade contractors.

HARLOW WOOD (Notts.).—Orthopædic hospital, Duchess of Portland's Home for Crippled Children; Hospital Committee.

HARWORTH.—Infants school (£9,200); Notts. Education Committee.

HERNE BAY.—Alterations, Red Lantern Cinema, High Street; C. H. R. Griggs. Telephone exchange, Victoria Park; Office of Works. Alterations, Norlands Hotel, Beacon Hill; Mr. Fay.

HORNCHURCH (Essex).—Housing scheme (40), for the U.D.C.; surveyor. Factory, Ardleigh Green, for Stafford Allen & Sons, manufacturing chemists, Long Melford, Suffolk.

KINGSTON-ON-THAMES.—Extensive alterations and additions to depository, Canbury Park Road, for Bentalls, Ltd.

LEATHERHEAD.—Elementary school; Surrey Education Committee.

LITTLE PLUMSTEAD.—Adaptation, Little Plumstead Hall, as mental hospital; Norfolk C.C.

LONDON (Greenwich, S.E.).—Roman Catholic Church (£10,000); Walter & Sons, architects; E. G. Bradford, contractor, Leicester.

(Woolwich, S.E.).—Extensions to Polytechnic (£60,000); A. E. Munby, architect.

(Chelsea, S.W.).—Dwellings for Chelsea Housing Improvement Society; A. S. Soutar, architect.

MANCHESTER.—Cinema, Wilbraham Estate; Mr. Griffiths, managing director. Refuse disposal plant, Water Street cleansing depot (deposit £1 1s.); city architect, Town Hall.

MIDDLETON.—Housing scheme (70), Middleton Junction (deposit £2 2s.); borough architect, Town Hall.

MITCHAM.—Two schools (660 places), for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

MORECAMBE.—Estate development, Pemberton Drive; Wm. Gardner & Co.

NANTWICH.—Engine and filter buildings, water works, for the U.D.C.; P. H. Paton, engineer, 25, Barker Street (returnable deposit of £2 2s.).

NEWTON ABBOT.—Thirty-two houses at Kingsteignton, for the R.D.C.; B. H. Palmer, architect, 11, Union Street.

NORTON.—School for West Riding E.C.; F. A. Darwin, clerk, County Hall, Wakefield.

NORWICH.—Education offices, Stracey Road; Edward Boardman & Son, architects.

POTTERS BAR.—School extension (£10,000); Middlesex Education Committee.

PRESTWICH.—Alterations, Club, Church Lane; Conservative Club, Ltd. Development, housing estate, Mere Clough; Waterdale Dyeing & Finishing Co., Ltd. Sixteen houses, Bury New Road; J. & W. Leach & Sons, Ltd.

READING.—Houses (120), Caversham, for the T.C.; A. A. Moynihan, builder, Bath Road, Theale.

RETFORD.—Conversion of The Haven, Queen Street, as secondary school (£6,000); Notts. Education Committee.

ROTHERHAM.—Block of shops for the T.C.; Chadwick & Co., Ltd., builders, College Road.

RUGBY.—Engineering wing, College of Technology (£6,665); W. W. Webster.

SALISBURY.—Additional 25 houses, for the T.C.; borough surveyor.

SHEPPERTON (Middlesex).—School (200 places), for the Church of England Managers; Rev. H. E. McLeod, rector.

SOUTH AFRICA (Cape Town).—100 cottages, Devil's Peak, for Corporation; C. J. Smith. Native housing scheme (£133,000), Langa township; city engineer.

SOUTHEND-ON-SEA.—Rebuilding business premises, 73 and 74, High Street, for J. Lyons & Co., Ltd., Cadby Hall, Kensington, W. Assembly room and public hall, North Avenue, for W. T. Cusdin.

STOWMARKET.—Extensions, secondary school; East Suffolk Education Committee. Junior elementary school; East Suffolk Education Committee.

STRETFORD.—School, Stretford Road, Old Trafford (deposit £2 2s.); P. Howard, architect, 88, Mosley Street, Manchester.

THETFORD.—Extensions to Boys' Grammar School; governors.

WAKEFIELD.—Additions, works, Elm Tree Street; Ripon Steel Co., Ltd. Adaptation and extension of Holmfield House, as art gallery and museum; city engineer. Retail fish market, part of wholesale market; markets superintendent. Gymnasium, dining rooms, &c., secondary school; Education Committee. Church, Dewsbury Road; Methodist Connexion Trustees. Hotel, Horbury Road; People's Refreshment House Association, Ltd.

WANTAGE.—Instruction centre; Berks. Education Committee.

WARMINSTER.—Hospital (£18,000); R. Butcher & Son, contractors.

WARRINGTON.—Housing block, Whitecross Institution; Wm. & Segar Owen, architects, Palmyra Square.

WHERSTEAD.—Elementary school; East Suffolk Education Committee.

WHITEHAVEN.—School (400 places), for the Borough E.C.; T. C. Bone, secretary.

WOKING.—Flats, Maybury; U.D.C. surveyor. Conversion of old fire station into offices; U.D.C. surveyor.

WOKINGHAM.—Secondary school; Berks. Education Committee.

WORTHING.—General Post Office (£35,000 to £40,000), for H.M. Office of Works; Wilson, Levatt & Co., builders, Wolverhampton & London.

WREXHAM.—Re-erection (after fire) of Abbot Leather Works, for Hugh Price & Co. (£25,000).

WROTHAM (Kent).—Housing scheme (40), for the U.D.C.; surveyor.